

Exploring urban landscape change and value: a case study of the waterways in Bangkok, Thailand

By:
Wanida Numsuk

A thesis submitted in partial fulfilment of the requirements for the degree of
Doctor of Philosophy

University of Sheffield
Faculty of Social Sciences
Landscape Architecture Department

August, 2024

Acknowledgement

Grateful acknowledgement is extended to the Almighty for accepting my prayers. I express gratitude to myself for exhibiting bravery in leaving behind my homeland and family to pursue my academic accomplishment in the UK.

I am obligated to the King Mongkut's Institute of Technology Ladkrabang (KMITL), my workplace, for granting me the scholarship that has facilitated my PhD studies. Gratitude is also extended to my colleagues in Bangkok. Their support has been invaluable to me.

Foremost, I express my heartfelt gratitude to my supervisor, Nicola Dempsey, whose unwavering support has been instrumental since the inception of my research journey. Her invaluable guidance, patience, and brilliant mentorship, particularly in refining my academic writing skills and procedural in conducting research, have been indispensable to my academic progress. I also appreciate the initial assistance provided by my second supervisor, Paul G Brindley, whose support has further enriched my research. Special thanks extend to my local supervisors in Thailand, Angsana Boonyobhas and Wilasinee Suksawang.

I extend my thanks to the Landscape Department, University of Sheffield, for providing me with seamless access to resources, financial support, and its conducive academic environment. This enabled me to pursue my academic learning and growing effectively. I also express my gratitude to my wonderful and diverse colleagues in Sheffield for fostering a positive workplace environment.

Special thanks are due to all the participants of my research – the residents of the three communities, numerous experts from academia and practice, especially the government agency staffs from various departments in Thailand– whose willingness to participate in interviews and focus groups has enriched my research immeasurably.

I am deeply grateful to my husband for his unwavering support and always believing in my abilities. My dear children have been a constant source of motivation, and I am grateful for their presence in my life. I extend my thanks to my parents-in-law for their support and assistance in caring for my children. My heartfelt gratitude goes to my parents for their blessings and prayers, without which I would not have reached this point. Lastly, I deeply express my appreciation to my beloved sisters, who have been my pillars of support and companions throughout my journey.

Abstract

Bangkok, a prominent urban centre in Southeast Asia, has a rich network of waterways shaped by its historical settlement. However, rapid urbanisation and unchecked growth have led to the degradation of these riparian cultural landscapes. This has led to vulnerability, exacerbated by uncertain climate change, and underscores Bangkok's status as one of Southeast Asia's most exposed coastal cities, as evidenced by the floods in 2011. Literature indicates that management interventions addressing flooding and heritage preservation have led to this urban landscape degradation and exacerbated local exclusion. Various academic studies have proposed alternative strategies, however, the status quo remains unchanged, with cultural heritage deterioration persisting alongside recurring urban flooding.

This research addresses the intricate nature of Bangkok's urban waterway transformation and its values, exploring how governance processes have influenced these changes. Three main overarching research questions are: How has the landscape of Bangkok's urban waterways changed over time, and what has influenced its alteration? How are Bangkok's urban waterways valued by different stakeholders? How is knowledge about Bangkok's urban waterways articulated by policymakers and practitioners, and how does this knowledge contribute to its governance and decision-making?

The institutional mechanisms and decision-making processes governing flood management and heritage preservation in relation to the management of Bangkok's urban waterways are examined to explore how knowledge and landscape values feature in this process. To do this, the study calls on primary data collected through extensive qualitative fieldwork, involving interviews and workshops with government agencies, experts, practitioners, NGOs, and residents in three waterway-adjacent communities, Banpantom, Minburi Upatum, and Talad Nongchok.

The findings identify a complex transformation of Bangkok's waterways that is intricately influenced by management actions, resulting in reduced accessibility, shifting settlement patterns, and complicated land ownership issues. Findings underscore the ongoing hindered agency working processes that influence urban waterway change. The research shows how different stakeholders consider alternatives in urban waterways' management stemming from the values they hold as professionals and highlights the potential contribution of locals as occupiers of intrinsically valued urban landscapes. These values reflect cultural complexity surrounding waterways which are variably translated into waterway management practices. Collaborative workshops demonstrate how a wealth of diverse perspectives has the potential to bring together knowledge, where separated expertise and values can be occupied and effectively integrated.

This concrete evidence emphasises the pressing requirement for collaborative efforts among agencies in Bangkok and meaningful engagement of residents in landscape management. It underscores the necessity for adopting a new strategy involving a multi-stakeholder approach and partnerships to address the complexities of the landscape amidst environmental uncertainties and promote social inclusivity in the face of contemporary urban challenges.

Acronyms

AC	Academics [participants]
AED	Agriculture Extension Department, Thailand National Agencies
AED-BMA	Agriculture Department, Thailand National Agencies, concerning Bangkok Metropolitan Area
BE	Built-environmental or water resource Engineers [participants]
BMA	Bangkok Metropolitan Administrator
BMR	Bangkok Metropolitan Region
BUB	Budget Bureau, Thailand National Agencies
BUD	Budget Department, Bangkok Agencies
BUW	Bangkok Urban Waterways
CO	Communities
CODI	Community Organisation Development Institute, Thailand National Agencies
DIO	District Officer, Bangkok Agencies
DPMD	Disaster Prevention and Mitigation Department, Thailand National Agencies
DSD	Drainage and Sewerage Department, Bangkok Agencies
EP	Experts and Practitioners [interviewees/participants]
FAD	Fine Art Department, Thailand National Agencies
FE	Flood management Experts [participants]
FID	Financial Department, Bangkok Agencies
GA	Government Agencies [interviewees/participants]
GRD	Groundwater Resource Department, Thailand National Agencies
HC	Heritage or Cultural landscape and experts participants
HRTN	Hydrological Royal Thai Navy Department, Thailand National Agencies
IA	International Agencies or NGOs [interviewees/participants]
LAD	Land Department, Thailand National Agencies
LED	Law Enforcement Department, Bangkok Agencies
MAD	Marine Department, Thailand National Agencies
MED	Meteorological Department, Thailand National Agencies
MWA	Metropolitan Water Work Department, Thailand National Agencies
NACC	Office of the National Anti-Corruption Commission
NBS	Nature-Based Solutions
NESDC	Office of National Economic and Social Development Council, Thailand National Agencies
NHA	National Housing Authority, Thailand National Agencies
NOB	National Office of Buddhism, Thailand National Agencies
ONEP	Office of National Resource and Environmental Policy Planning, Thailand National Agencies
ONWR	Office of National Water Resource
PM	Place-making Experts [participants]
PWD	Public Work Department, Bangkok Agencies
PWTPD	Public Works and Town& Country Planning Department, Thailand National Agencies
RC-ONEP	Rattanakosin Committee of ONEP, Thailand National Agencies
RE	Residents [interviewees]

RID	Royal Irrigation Department, Thailand National Agencies
RQ	Research Question(s)
RTD	Royal Treasure Department, Thailand National Agencies
SAO	State Audit Office of the Kingdom of Thailand
SED	Strategy and Evaluation Department, Bangkok Agencies
SES	Social Ecological System
TAT	Tourism Authority of Thailand, Thailand National Agencies
TOD	Transit Oriented Development
TOR	Term of References
TPD	Town Planning Department, Bangkok Agencies
TTD	Traffic and Transport Department, Bangkok Agencies
UP	Urban planning or Political science experts [participants]
UPE	Urban Political Ecology
WB	Waterbody Experts [participants]

Table of Contents

Acknowledgements..... II
Abstract..... III
Acronym..... IV
Table of contents..... VI

Chapter 1 Introduction..... 1

1.1 Bangkok and its waterways..... 1
1.2 The pressures on Bangkok's waterways..... 1
1.3 Bangkok's management trajectory..... 2
1.4 The gap in knowledge..... 3
1.5 The scope of research..... 3
1.6 Research questions..... 5
1.7 Research methodology..... 5
1.8 Thesis structure..... 6

Chapter 2 Literature review..... 8

2.1 Introduction..... 8
2.2 Landscape approaches and 'water' related landscape value..... 9
2.2.1 Landscape conceptualisations: nature, society, and culture..... 9
2.2.2 Intertwining of nature and culture: Water-heritage..... 10
2.2.3 Values in landscape and waterways..... 11
2.2.4 Exploring implementation and study of landscape approaches..... 13

2.3 Change and complexity in water-related urban landscapes..... 15
2.3.1 The study of landscape change and driving force..... 15
2.3.2 Complexity of landscape change in the urban waterway setting..... 16
2.3.3 Uncertainty of change: floodings and forecasting in Bangkok..... 18
2.3.4 Theoretical underpinning in understanding change and complex landscape.. 20

2.4 Landscape governance in a changing water-relate landscapes..... 22
2.4.1 The role of management in (unintended) changing landscapes..... 24
2.4.2 Bangkok's governance and political economy..... 25
2.4.3 Flood management in Bangkok..... 27
2.4.4 Conservation management in the Old Town Bangkok..... 29
2.4.5 Management action and values in landscape..... 30

2.5 Obstacles to collaboration and participation..... 32
2.5.1 Conceptualisations of collaboration..... 32
2.5.2 Knowledge and value in decision-making..... 35
2.5.3 Local knowledge and participation..... 39
2.5.4 Obstacles to implementation..... 42
2.6 Conclusion..... 45

Chapter 3: Methodology.....46

3.1 Introduction..... 46
3.2 Philosophical foundations and qualitative research..... 46
3.2.1 Social constructionism and research into decision-making..... 46
3.2.2 Abductive research strategies.....49
3.3 Desk review..... 49
3.3.1 Document review and policy analysis.....50
3.3.2 Historical maps, photographs, and archival documents.....50
3.4 Research design..... 51
3.4.1 Case study method and study site selection.....51
3.4.2 A qualitative approach to participant selection.....60
3.5 An iterative approach and the sequential research design.....64
3.5.1 Researcher positionality..... 65
3.5.2 Interviews (The first phase)..... 66
3.5.3 Focus groups/ workshop activities (The second phase)..... 68

3.6 Thematic analysis..... 70
3.7 Building materials.....76
3.8 Research ethics and integrity..... 78
3.9 Reflections on field work..... 79

Chapter 4: The case study context..... 82

4.1 Introduction..... 82

Section 1 Bangkok context
4.2 Management structures concerning waterways.....82
4.3 Waterways and conservation policies..... 87
4.4 Waterways and floods prevention policies..... 91

4.5 History of Bangkok's waterways.....95
4.5 1 Geography of landscape and early settlement (1470-1767) 95
4.5.2 Water city: Waterway excavation and its role in Bangkok (1782-1866) 97
4.6 Waterway change and urban development in Bangkok..... 101
4.6.1 Modern city with waterways emphasised: a shifting approach (1860-1940s)... 101
4.6.2 Rapid urbanisation and neglected waterways (1950s-2020s) 104

Section 2 the study sites
4.7 Banpantom Community and the Banglampoo Canal.....107
4.8 Minburi Uppatum Community and the Sanseab Canal..... 113
4.9 Talad Nongchok Community..... 119

Chapter 5: Bangkok Urban Waterway, landscape change and stakeholder values.....123

5.1 Introduction.....123
5.2 The Bangkok Urban Waterway's alteration.....123
5.2.1 Structure and illegal encroachment.....123
5.2.2 Building re-orientation..... 125
5.2.3 Ownership and boundary changes..... 126
5.2.4 Waterways are controlled or disappear..... 128
5.2.5 Poor water quality and absent biodiversity..... 130
5.2.6 Diminished accessibility and visibility.....132
5.2.7 Change in impact of inundation..... 134

5.3 Performance of Bangkok Urban Waterway governance..... 136
5.3.1 Collaboration versus fragmentation..... 136
5.3.2 Informative communication..... 137
5.3.3 Centralised power, political timeframes and bribery.....137
5.3.4 Lack of autonomy..... 138
5.3.5 Meaning in resident engagement..... 139
5.3.6 Lack of research into implementation.....141
5.3.7 Data limitations in decision-making.....141
5.3.8 Different agencies' interests and limited knowledge..... 142
5.3.9 Time and fiscal limitation..... 143
5.3.10 Insufficient regulation and enforcement.....143

5.4 Desirable changes for Bangkok Urban Waterways.....145
5.4.1 Enhanced ongoing management.....145
5.4.2 Natural restoration.....152
5.4.3 Prioritising benefits for locals..... 155
5.4.4 Floodable land use with heritage consideration..... 158
5.4.5 Highlight urban functionality..... 161

5.5 Landscape value of waterways in Bangkok 165
5.5.1 Food production value..... 165
5.5.2 Daily consumption value.....166
5.5.3 Transportation value..... 167
5.5.4 Ecological/ biodiversity value.....169
5.5.5 Livelihood value..... 171
5.5.6 Favourable settlement value.....172
5.5.7 Day-to-day cultural value.....173
5.5.8 Preservation value..... 173
5.5.9 Local recreation value..... 174
5.5.10 Urban public space value.....174
5.5.11 Natural inundation value..... 175
5.5.12 Flood prevention value..... 176

5.6 Value manifested in relation to urban waterway management..... 180

Chapter 6: Values and knowledge in decision-making of BUW management..... 182

6.1 Introduction..... 182
6.2 The values held in decision-making process 182
6.2.1 Three types of values transformation 182
(1) Diminishing values..... 182
(2) Absent values..... 183
(3) Evolving values..... 183
6.2.2 Values from individual stakeholders' recommendations..... 184
6.2.3 Values from stakeholders' collaborative decision-making..... 184

6.3 Shared expertise/ shared vision..... 186
6.3.1 Integrated natural and historical significance..... 186
6.3.2 Considering structural measures in BUW..... 187
6.3.3 Justification of adaptive land use..... 188
6.3.4 Balanced benefits as a place of heritage..... 189

6.4 Consideration of prioritisation..... 191
6.4.1 Levels of change..... 191
a. Minimal and irrelevant change..... 191
b. Substantial change that is pertinent..... 191
c. Overwhelming change with resulting resistance..... 192
6.4.2 Feasibility of implementation..... 192
a. Challenging but of great significance..... 192
b. Extremely challenging and unlikely..... 193
c. Simplicity and more possibility..... 193
6.4.3 Outcome assessment..... 194
a. Long-term outcome of considerable importance..... 194
b. Short-term and inconsequential..... 194
c. Significant knock-on effect..... 195
d. Sequential outcome and of little significance..... 195
6.4.4 Perceived benefits..... 195
a. Benefits favouring specific groups 195
b. Primarily profiting locals 196
c. Benefits serving the public with great importance 196
6.5 Challenges in knowledge sharing between stakeholders..... 197

Chapter 7: Discussion..... 198

7.1 Introduction..... 198
7.2 Revealing the unintended changes of BUW and their complexity..... 198

7.3 Understanding influencing change from governance and the need for its reform..... 200
7.3.1 Strong influence of agencies..... 201
7.3.2 Participation process..... 204

7.4 Revealing the position of landscape knowledge in managing BUW..... 206

7.5 Revealing local values through community-driven action..... 211

7.6 Revealing absent values in managing BUW.....214
7.6.1 Why BUW should (not) all be public space?.....214
7.6.2 The forgotten detention role of flood prevention value in BUW..... 215
7.6.3 Challenging the concept of water-heritage in Bangkok: preservation value. 216

7.7 Decision-making and held values: dilemmas in public good and locals benefit..... 218
7.8 Example of institutional collaboration in occupying landscape approach..... 220

Chapter 8: Conclusion.....222

8.1 Introduction..... 222
8.2 Contribution to knowledge..... 222

8.3 Recommendations for future change of BUW..... 226
8.3.1 Governance dynamics intertwined with landscape change..... 226
8.3.2 Significance of values in the future and roles in shaping decision-making processes.....226
8.3.3 Recognising challenges and engaging with the landscape approach..... 227

8.4 Recommendation of components in studying urban landscape.....229
8.5 Contribution to changes in practice and policy.....230
8.5.1 Transparent data sharing among different stakeholders.....230
8.5.2 Collaboration among government agencies.....230
8.5.3 Involvement of facilitators or third-party..... 231
8.5.4 Educational institution Involvement.....231
8.5.5 Decentralisation and accountability in locals 232
8.5.6 Share benefits and consent among stakeholders.....232
8.6 Conducting future research..... 233

References.....234

Appendices..... 250

Appendix 1 Detail in data analysis and data collection.....250
Appendix 2 Additional information on the Bangkok context and policies 261
Appendix 3 Supplementary research findings.....277

Figure 2-1 The clustering of literature for reviewing..... 8
Figure 2-2 Amsterdam green city concept's plan (Left) The waterways in Amsterdam (Right)..... 13
Figure 2-3 Conceptual diagram of SES, UPE frameworks, and Landscape approach..... 20
Figure 2-4 Users-management organisation-landscape..... 23
Figure 2-5 Areas outside Bangkok affected by 2011's significant flooding..... 28
Figure 2-6 Hindu temple with high wall which historically was on the riverbank (Left), and locked gates (Right) indicate the inaccessibility of Sabarmati Riverfront..... 31
Figure 2-7 Flood management in Bangkok- current structure (Above), suggesting structure (Below) 34
Figure 2-8 Four modes of organisational decision making..... 37
Figure 2-9 The research questions framing from the clustering of literature..... 45
Figure 3-1 Diagram illustrating the methodology employed in the thesis..... 47
Figure 3-2 The study of BUW through landscape approach: human-environmental interaction concerning landscape governance study..... 48
Figure 3-3 Historical photographs showing differences of water-level of the Ong Ang Canal..... 51
Figure 3-4 A single case of Bangkok urban waterway with the three different study sites as the units of analysis..... 52
Figure 3-5 Process of selecting study sites from a larger number..... 52
Figure 3-6 Bangkok Metropolitan Area and its impact flood area, utilised data from flood data using GIS spatial analysis..... 54
Figure 3-7 Bangkok Metropolitan Area and its policies involving BUW, including flood records, utilised data from policy documents..... 55
Figure 3-8 The selected sites using case study selection criteria..... 57
Figure 3-9 Flood information of the three selected study sites..... 58
Figure 3-10 Land cover of the three selected study sites..... 59
Figure 3-11 Land use from the 2020s Comprehensive Plan of the three selected study sites..... 60
Figure 3-12 Diagram of interviewees and participants in data collection..... 61
Figure 3-13 The proposal of perfect focus group (FG) combination..... 63
Figure 3-14 Combinations of participants in the eight focus groups..... 63
Figure 3-15 The methodological approach in this research..... 64
Figure 3-16 The go-along interview with the community leader at Talad Nongchok..... 67
Figure 3-17 Examples of hand sketches and notes taken during the survey at Banpantom (Right) and Minburi Upatum (Left) translated into English..... 67
Figure 3-18 Discussion of BUW schemes through the small cards (Left), and scenarios through the diagram sections (Right) 69
Figure 3-19 Discussion of Banpantom's scenarios (Left), and of shared visions through materials (Right) 69
Figure 3-20 List of codes with their files and reference numbers, created during the inductive or open-coding..... 72
Figure 3-21 Example coding of theme 'performance of BUW governance' and 'BUW value'..... 72
Figure 3-22 The tool "explore queries" from "crosstab" of the selected theme: BUW's value, and selected cases: stakeholders..... 75
Figure 3-23 The developed themes with the selected theme "management approach"..... 76

Figure 3-24 The 16 small cards of the 16 BUW's alteration schemes……77
Figure 3-25 Four sets of diagram sections, five sections to each set……77
Figure 4-1 The (executive branch) structure concerning the management of Bangkok's waterways and their surrounding areas…… 83
Figure 4-2 The water treatment plants in Bangkok…….. 86
Figure 4-3 The water transportation in BUW…….. 87
Figure 4-4 The groups of eastern conservation projects from Conservation Masterplan 1994…… 88
Figure 4-5 Perspectives showing the walkway proposed along the historical canals: Ku Meang Derm Canal, Rob Krung Canal, and North-South Lod Canal (Left), and Ong Ang Canal (Right) …… 88
Figure 4-6 The Mahakart Fort: the terrace of the residential area nearby the moat (Left), the green space with the fence along the moat (Right)……89
Figure 4-7 The conservation zone of Bangkok (1982, 1994, 1997's plans) (Left), The extended conservation area now includes four zones (Right)……90
Figure 4-8 the flood protection management of Bangkok……91
Figure 4-9 The concept of the flood operating system in Bangkok using structural measures…….. 92
Figure 4-10 the major waterways that were picked to allow the northern water run-off (Left), the seven districts affected by the northern water (Right) …….. 92
Figure 4-11 Bangkok and its surroundings with three hierarchies of flood risk area, Level 1-3……93
Figure 4-12 Map of the flood management by JICA to the delta scale……94
Figure 4-13 The riverlike along the River at the Kanlayanamit Temple (originally constructed in 1996, increase height in 2012)……94
Figure 4-14 Thailand (Left), Chaophraya Delta (Middle), Bangkok and the Gulf of Thailand (Right)……95
Figure 4-15 The waterways with their functions and the settlement relation……96
Figure 4-16 The trenches or water-flow into Lampradong or ditches in the orchards unit at ebb-tide (Left), The orchard plot of coconut tree consisting of ridges or dikes and trenches or ditches (Right)……96
Figure 4-17 Waterway excavation records during 1400s-1700s……97
Figure 4-18 Waterway excavation records during 1700s-1800s and 1855-1868……98
Figure 4-19 Historical overview of Bangkok's waterways…… 99
Figure 4-20 The chronology of the public management in Bangkok and those related waterway……100
Figure 4-21 Waterway excavation records during 1868-1908…… 101
Figure 4-22 Regional scale: the irrigation projects in the upper Chaophraya Basin (Left), Minor scale: the shallowness of the canal at Phratu Pee in 1950…… 102
Figure 4-23 Bangkok waterways during the city's development (early 1900s)……103
Figure 4-24 The Greater Bangkok Plan making in 1960 (Left), the revision of 1971 (Right)..104
Figure 4-25 Bangkok comprehensive plan 1992 (Left), 2020s's plan (draft) (Right)…… 105
Figure 4-26 Recent overview of Bangkok's urban waterways……106
Figure 4-27 The three study sites…….. 107
Figure 4-28 The waterways network in the Tork Banpan and Ban Lor Canal Communities..108
Figure 4-29 Historical overview of the Banglampoo Canal and the minor waterways……. 109
Figure 4-30 Banpantom's area before 1926 (Left), in 1958 (Right)……109

Figure 4-31 Diagram showing the chronology of the three communities..... 110
Figure 4-32 Banpantom Community..... 111
Figure 4-33 The watergate at Banlampoo Canal connected to the River after 1957 (Left),
The watergate in 2022 (Right) 112
Figure 4-34 The diagram flood management map showing the structure measures in the
eastern Bangkok waterway..... 115
Figure 4-35 Historical overview of the minor waterway in Minburi community,
and the Sanseab Canal..... 116
Figure 4-36 Minburi 1948: note the wooden bridge at rear of photograph (Left),
the intersection of the Sanseab, Songton Nun, and Samwa Canal (Right).....116
Figure 4-37 Minburi Upatum Community..... 117
Figure 4-38 Talad Nongchok Community..... 119
Figure 4-39 The white-boat in Sanseab Canal with Phratu Nam and Chaleam Lok Bridge
at the back of the photograph (Left), the white-boat and watergate called
Tha-Kai in Chachengsao (Right) 120
Figure 4-40 Historical overview of the minor waterway, Sanseab Canal, Talad Nongchok... 120
Figure 4-41 The Nongchok neighborhood with markets activities and the water
transportation provided (refer to 1910s).....121
Figure 5-1 Historical bridge overlapping on the renovation of walkway along Banglampoo
Canal (Left), Walkway with embankment along Sanseab Canal in Minburi
Upatum (Right)..... 123
Figure 5-2 The flood dike (Left), an improper structure of embankment along Sanseab
Canal in Talad Nongchok (Right)..... 124
Figure 5-3 The residential settling in Sanseab Canal's bank before 2019 (Left),
Some of the houses being removed from the Sanseab Canal's bank (Right)..... 124
Figure 5-4 A non-function rice mill in Minburi District (Left), Banlampoo Canal
being the backyard of the buildings (Right)..... 125
Figure 5-5 Talad Nongchok during the city's development.....126
Figure 5-6 The Banglampoo Canal and Banpantom during the city's development..... 127
Figure 5-7 Recent overview of the Banglampoo Canal and the community..... 128
Figure 5-8 The alleys used to be the minor waterway (Left), and networking
to the River (Right)..... 129
Figure 5-9 Minburi Upatum and Sanseab Canal during city development..... 129
Figure 5-10 A minor waterway used to connect to Sanseab Canal (Left), a minor waterway
used to run around Parinayok Temple through Banblampoo Canal (Right)..... 129
Figure 5-11 Minburi Upatum: Sanseab Canal before the embankment construction (Left),
An embankment along the Sanseab Canal (Right).....130
Figure 5-12 Recent overview of the minor waterway, community, and the Sanseab Canal. 131
Figure 5-13 Construction of piping under Sanseab Canal (Left), Low water quality (Right)..131
Figure 5-14 The local's embankment protecting erosion along Sanseab Canal.....132
Figure 5-15 The embankment with no accessibility to Banglampoo Canal in Banpantom... 132
Figure 5-16 Stair created by local nearby Saint School in Nongchok Neighborhood..... 133
Figure 5-17 Blocked visibility flood dike in Sanseab Canal at Talad Nongchok (Left),
the structure being broken (Right).....133
Figure 5-18 Recent overview of the Sanseab Canal and Talad Nongchok..... 133
Figure 5-19 Floodwater in the Tha Phra Artit Road Banglampoo District in 2011.....134

Figure 5-20 The flood incident in 2011 (Left) The flood incident in 2022 (Right) in Minburi Upatum..... 135
Figure 5-21 The water-level got high during September 2022..... 135
Figure 5-22 The damaged embankment along Sanseab Canal in Talad Nongchok (Right) and lean of the structure (Left)..... 140
Figure 5-23 The GA's investigation to Nongchok Area where the embankment has been breached during 2020..... 140
Figure 5-24 Five schemes representing Scenario I: Enhanced ongoing management..... 145
Figure 5-25 The eastern BUW's section diagram representing scenario of "enhanced ongoing management"..... 145
Figure 5-26 Enhanced ongoing management as recommended in Banpantom..... 147
Figure 5-27 Enhanced ongoing management as recommended in Minburi Upatum..... 148
Figure 5-28 Enhanced ongoing management as recommended in Talad Nongchok..... 149
Figure 5-29 Two schemes representing Scenario II: Natural restoration..... 152
Figure 5-30 The eastern BUW's section diagram representing scenario of "natural restoration"..... 152
Figure 5-31 Natural restoration as recommended in Banglampoo..... 153
Figure 5-32 Natural restoration as recommended in Minburi Upatum..... 153
Figure 5-33 Natural restoration as recommended in Talad Nongchok..... 154
Figure 5-34 Four schemes representing Scenario III: Prioritising benefit for locals..... 155
Figure 5-35 The eastern BUW's section diagram representing scenario of "prioritising Benefits for locals" 155
Figure 5-36 Prioritising benefits for locals as recommended in Minburi Upatum..... 156
Figure 5-37 Prioritising benefits for locals as recommended in Talad Nongchok..... 157
Figure 5-38 Prioritising benefit for locals as recommended in Banpantom..... 158
Figure 5-39 Two schemes representing Scenario IV: Floodable land use with heritage consideration..... 158
Figure 5-40 The eastern BUW's section diagram representing a scenario of "floodable land-use with heritage consideration" 159
Figure 5-41 Floodable land use with heritage consideration as recommended in Talad Nongchok..... 159
Figure 5-42 Floodable land use with heritage consideration being recommended in Minburi Upatum..... 160
Figure 5-43 Floodable land use with heritage consideration being recommended in Banpantom..... 161
Figure 5-44 Three schemes representing Scenario V: Highlight urban functionality..... 162
Figure 5-45 The eastern BUW's section diagram representing a scenario of "highlight Urban functionality"..... 162
Figure 5-46 Highlight urban functionality as recommended in Banpantom..... 163
Figure 5-47 Highlight urban functionality as recommended in Talad Nongchok..... 163
Figure 5-48 Highlight urban functionality as recommended in Minburi Upatum..... 164
Figure 5-49 The edible plantation (Left), and traditional *Yok Yor* fishing method (Right) in Talad Nongchok..... 166
Figure 5-50 Sanseab Canal's daily consumption of washing dishes in Talad Nongchok..... 167
Figure 5-51 Historical use of boats along Sanseab Canal in Talad Nongchok..... 168
Figure 5-52 The use of boats in Sanseab Canal in Nongchok Area..... 169

Figure 5-53 The Banglampoo Tree along the Chaophraya River, later perished subsequent To the 2011 flood.....170
Figure 5-54 Local merchant along the walkway adjacent to Banglampoo Canal in Banpantom: proposed to be removed by the DIO 172
Figure 5-55 The accessibility for locals to enjoy Sanseab Canal..... 174
Figure 5-56 Pumps at the watergate in Sanseab Canal nearby Talad Nongchok (Left), Pumping station in conservation canal at Pakkhlong Talad (Right) 176
Figure 6-1 Diagram of three types of landscape values of BUW.....182
Figure 7-1 Existing communication process (Left), Potential collaboration emerging from the findings (Right)..... 201
Figure 7-2 Current working structure of the government agencies relating BUW (Left) Potential collaborating work, emerging from the findings (Right) 202
Figure 7-3 Existing fixed objectives/hidden data/resident involvement through facilitator (Left), Potential shared objectives/data, and meaningful resident involvement (Right) 205
Figure 7-4 Rigid boundary (Left), and non-rigid boundaries of BUW as the landscape element: the structured embankment (Top-Right), and the non-structured BUW (Bottom-Right) 208
Figure 7-5 BUW's values from research's findings that RE addressed compared to GA..... 211
Figure 7-6 BUW's values expressed by RE compared to GA..... 212
Figure 7-7 Agencies concerning management action relation to BUW..... 221
Figure 7-8 Examples of institutional collaboration concerning landscape approach in managing BUW..... 221
Figure 8-1 BUW's findings through user-landscape-management organisation model..... 229
Figure 8-2 BUW's components relationship of thesis findings (Left), the recommendation (Right)..... 229
Table 2-1 Different definitions of knowledge within the discipline of environmental management..... 36
Table 3-1 The site selection criteria.....52
Table 3-2 The list of sites along the BUW (columns) and their potential scores given by using three criteria..... 56
Table 3-3 The potential study sites.....57
Table 3-4 The final three study sites with the variation of information-oriented selection..58
Table 4-1 Flood recorded..... 107
Table 5-1 The desirable management of three-community's scale recommended by stakeholders..... 151
Table 5-2 The value stakeholders attribute to the historical and current context..... 177
Table 5-3 The relationship of landscape value and the stakeholders' references.....178
Table 5-4 The similarity and differentiation of stakeholders in interpreting values in BUW. 179
Table 5-5 The relationship between policy documents and landscape value of BUW..... 180
Table 5-6 The relationship between 'Landscape value' and 'Desirable change'..... 181
Table 6-1 Landscape value held about BUW in the data analysis..... 183
Table 6-2 Values expressed about BUW by individual stakeholders.....184
Table 6-3 The values addressing and areas of expertise in individual tasks and workshop.. 185
Table 6-4 The values held in decision-making of workshop activities.....186
Table 6-5 Areas of expertise and values expressed in individual tasks and workshops through the community contexts.....190

Chapter 1 Introduction

1.1 Bangkok and its waterways

Thailand has a history closely related to water, and its people developed effective ways to live along the water. Bangkok, one of the country's important historical water settlements, became the capital city over 200 years ago (LePoer, 1989). It developed from what was once a modest trading post nestled at the mouth of the Chao Phraya River (Askew, 2002). The city boasted a rich tapestry of waterway networks woven into its history by centuries of human settlement (Shinawatra, 2012), representing more than just channels of water. These waterways, intricately intertwined with Bangkok's geographic and cultural fabric, have long served as essential elements of the city's identity and form a complex tapestry of cultural heritage (Aruninta, 2013, Thaitakoo et al., 2012, Molle, 2007).

The ecological process of natural inundation made Bangkok a favourable landscape with waterways of high value for human settlement because of the fertile soil and resulting plentiful food production (Jiarakul, 2015, Duangporn Nopkhun, 1982). The settlement was seasonally underwater, creating a unique character that responded to flooding and tidal conditions (Askew, 1996, Askew, 2002, Yodsurang and Yasufumi, 2015). People adapted their ways of life to this natural process, including living in rafting communities, constructing elevated housing and other responses to hydro-ecological dynamics (Tanabe, 1997, Askew, 1993, Askew, 1996).

In recent decades, this vibrant coastal metropolis in Southeast Asia has witnessed a significant population surge, reaching over 11 million residents in 2022, a stark increase from just 1.3 million in 1950, with the urban growth trend continuing (UN, 2022). This sprawling city has transformed into Thailand's foremost urban centre, assuming a pivotal role in the nation's advancement and serving as a hub for governmental and administrative activities (Ratanawaraha, 2013).

1.2 The pressures on Bangkok's waterways

There is increasing discussion of existing issues in the context of Bangkok about the formidable challenges stemming from rapid urban expansion and degradation in the landscape. The unchecked pace of widespread urban development has wrought profound damage often at the expense of environmental integrity (Nantavisai and Thaitakoo, 2023, Thaitakoo and McGrath, 2008) and traditional heritage degradation (Casper, 2015, Tantinipankul, 2012, Jiarakul, 2015). The ongoing unplanned development pattern has also led to encroachment issues and shifts in social structure (Tantinipankul, 2012). Often, housing pockets of historic settlements have deteriorated into informal settlements (Unakul, 2012).

Because of these pressures, the overall role of Bangkok's waterways has changed from being an important part of the city's culture, social structure and economy to a neglected element with poor cultural function (Nopkhun and Thadaniti, 1982, Tohiguchi et al., 2002, Davivongs et al., 2012), and ecological service (Thaitakoo et al., 2018, Thaitakoo et al., 2012). The

persistent march of urbanisation has reshaped the features of waterways, altering their functions and character seeing through the effluent water body, widespread culverting, covering, and abandonment in some places, effectively acting as a sewage channel across Bangkok's waterways (Boonlert, 2021, Chansiri, 1999).

The negative outcome of landscape degradation and climate change (Yusuf and Francisco, 2009, Jha et al., 2012) was evident in the incident of Bangkok 2011's flood. Bangkok is predicted to lose 80% of its land in the year 2200 due to future flooding (Desmet et al., 2021). The 2011 flood incident demonstrated the hypothesis of sinking cities and severe flooding in vulnerable coastal cities, a vulnerability shared by cities worldwide, such as Amsterdam (Manzini et al., 2022), Jakarta (Colven, 2023), and Ho Chi Minh (Lempert et al., 2013).

1.3 Bangkok's management trajectory

The fragmented approach to land management (Ratanawaraha, 2016b, Ratanawaraha, 2013, Marks and Lebel, 2016) and the lack of coordination (Webster and Maneepong, 2009) pose significant challenges in Bangkok. Flood management predominantly relies on hard infrastructural measures without effectively integrating soft structures (Saito, 2014, Thanvisitthpon et al., 2018, Laeni et al., 2019), potentially exacerbating social vulnerability outside the protected economic hub (Marks et al., 2020, Marks, 2015). Conservation efforts to promote a protective stance (Tantinipankul, 2012) arguably priorities visitor attraction for economic reasons, reordering, and relocation efforts, but have led to social inequality and a disregard for the everyday practices of traditional communities (Issarathumnoon, 2020, Prakitnonthakan, 2012). Scholars have addressed the intricate nature of changes in Bangkok's waterways underlying processes, and factors driving them, including the role of governance in facilitating or mitigating these changes (Marks, 2016, Sajor and Onfsakul, 2007, Davivongs et al., 2012).

Meanwhile, many studies about Bangkok recommend alternative approaches to bolster environmental resilience, and social cohesion, paving the way for more informed and cohesive management approaches. These studies include adopting ecological landscapes from a natural standpoint (Thaitakoo and McGrath, 2010), a social and cultural standpoint (such as Issarathumnoon, 2020), and a cultural landscape initiative (Aruninta, 2013). Many recommendations also drive efforts for collaboration (Jular, 2011), bridging institutions (Saito, 2014), and improving local involvement (Peerapun et al.,2020).

More than a decade has passed since the 2011 flood, and numerous studies have scrutinised the measures taken by decision-makers to address this environmental issue and social inequality. Despite this, the status quo remains unchanged. Little improvement has been observed, and cultural heritage continues to decline in water-based communities and urban flooding persisting on an annual basis.

1.4 The gap in knowledge

The continuous deterioration of Bangkok Urban Waterways (BUW) and the direction of management actions raise questions, which lead to the knowledge gap addressed in this research. The intent behind management actions involving the landscape of BUW and policy translation into practical implementation, particularly to the micro-scale of contextual local communities remains vague. The institutional mechanisms governing flood management and heritage preservation in Bangkok as the context of dense urban city have not been studied together despite their inherently intertwining flooding and cultural heritage. Therefore, there is a necessity to explore them in the context of urban development in megacities to determine how their actions influence BUW.

Meanwhile, the urban waterways represent a multifaceted blend of cultural heritage entangled with the blue infrastructure network of the urban landscape. Despite their significance, there remains a dearth of understanding regarding their functions and values, especially among different stakeholders. Furthermore, while there is widespread recognition of community-driven initiatives being pivotal in fostering cohesive management practices, the extent to which this applies to BUW remains vague. The communication dynamics between institutions and local communities are ambiguous. This needs exploration to identify and bridge any existing gaps in understanding meaningful local involvement in BUW.

Numerous studies conducted in Bangkok advocate for alternative approaches and call for increased collaboration and engaged participation. Despite these recommendations, the prevailing management direction remains largely unchanged. This prompts inquiries into the decision-making processes. The reasons why the current management trajectory continues without adopting the alternatives suggested by academic studies remain unaddressed, and how knowledge in the decision-making process is being constructed and utilised is still unspecified. This needs investigation to address the obstacles and provide solutions to help overcome them.

1.5 The scope of research

The scope of this research primarily investigates the urban landscape in Bangkok. In this holistic approach, the examination of BUW extends beyond merely analysing waterways; it also encompasses an exploration of surrounding areas as integral components of the broader landscape. This research considers both the water and land sectors that are intertwined with both waterbodies and area-adjacent waterways, recognising their interconnectedness and interdependence (Stenseke et al., 2012).

The study encompasses human-environmental interaction, considering changes and complexities in the urban landscape (Forman, 1995, Forman, 2008), concentrating on alterations in water-related urban settings (Innes and Booher, 1999). The primary concern of in this research is the driving force of change, investigating the processes underpinning these changes (Nassauer, 1995, Antrop, 2005), including the institutions influencing and instigating them (Bürgi et al., 2004). Landscape history (Selman, 2012) considers the changes in Bangkok's waterways spanning from the early settlement period to the current urban context (before 1750s-2020s).

The study explores urban management by understanding it as multi-stakeholder collaboration (Reed et al., 2016, Jansson et al., 2019) in the context of BUW. It explores the design and planning of water heritage (Willems and Schaik, 2015) as cultural landscape (Selman, 2012). The implications of adaptive land use, a conceptualisation consistently recommended in Bangkok (Aruninta, 2013), are further investigated. Following this, the notion of adaptability is considered both from an ecological standpoint in design planning (Hein et al., 2020) and from a social standpoint in the management field (Folke et al., 2010) in the context of BUW.

The consideration of study captures landscape value in the realm of values held about waterways (Ehrlich and Mooney, 1983), including exploring the values that change over time (Misiune and Depellegrin, 2022), and considering how different stakeholders perceive BUW. This BUW's value is also considered in this study for their relationship with management action (after Plieninger and Bieling, 2012, Dempsey et al., 2018) and manifesting in policy planning. Moreover, the study also addresses the role of landscape value in decision-making processes, including their positions in constructed knowledge (Todt and Lujan, 2014, Lele et al., 2023, Choo, 2002).

The research examines dimensions of flooding and heritage perspectives through an examination of landscape governance (Görg, 2007, Oosten et al., 2021). It is crucial to highlight that this research emphasises the landscape features of the urban waterway as the central focus rather than concentrating solely on the viewpoint of specific management practices. The study explores this main characteristic of BUW that plays a role in the intricate institutional interplay when considering the same elements of this landscape in their policy and planning.

Following this, the study explores BUW in terms of management actions and institutional performance. The study considers government proposals around conservation policy, flood prevention policy, and urban development policy, including planning and policies where relevant in the context of traditional waterway communities. The institutional focus extends to both national and local government agencies in Bangkok. The practical implementation of those policies and planning is evaluated by considering their rhetoric and the execution of actions, including non-implementation tasks (Alexander and Faludi, 1989, Sharman and Perkins, 2017). The study also examines the factors influencing stakeholders' decisions to undertake or abstain from specific management actions and planning (Dobson and Dempsey, 2021).

The study rigorously explores the extent of local involvement in management and the communication between different agencies and residents in managing BUW's community to understand exactly what happens in the participation process (after Arnstein, 1969). The exploration also lies within an investigation of local knowledge (Berkes et al., 2000, Folke, 2004) to understand how landscape value is held by local residents. This is to explore the residents' positions (Raymond et al., 2010) in contributing to the BUW's management.

1.6 Research questions

Three main research questions and sub-questions are addressed in the thesis:

1. How has the landscape of BUW changed over time, and what has influenced its alteration?

    1.1 What is the process of urban landscape change, and how does the governance of BUW contribute to it?
    1.2 To what extent has the policy rhetoric around Bangkok's urban waterways been implemented in practice?

2. How are Bangkok's urban waterways valued by different stakeholders?

    2.1 How are landscape value and landscape management expressed by stakeholders, particularly those in flooding and heritage management?
    2.2 To what extent do the stakeholders' interpretations of landscape value change over time?
    2.3 How is landscape value manifested in relation to the management of BUW?

3. How is knowledge about BUW articulated by policymakers and practitioners, and how does this knowledge contribute to its governance and decision-making?

    3.1 How is knowledge from the different stakeholders interpreted when considering landscape change and management alternatives?
    3.2 How is knowledge interpreted when stakeholders collaboratively consider landscape change and management alternatives?
    3.3 How can shared visions of Bangkok's future waterways be achieved and barriers be addressed?

1.7 Research methodology

To address the gaps in knowledge, the research design takes a landscape approach to understand the human-environment interactions that occur within. The study aligns with the theory of social constructionism, which emphasises how shared meanings and beliefs are collectively created and maintained within a social group or society (Burr, 2015, Galbin, 2014). As an examination of research in decision-making (Choo, 2002, Lele et al., 2023), the study employs qualitative research methods rather than quantitative ones (Ritchie et al., 2013).

Under this theoretical umbrella of social constructionism, the study employs an abductive strategy, in which knowledge is derived from both existing literature and data collection simultaneously by starting to identify gaps in knowledge from existing literature before gathering data and incorporating ideas into data collection (Blaikie, 2007, Graebner et al., 2012). The researcher takes an iterative approach (AQR, 1980, Tracy, 2018) and the sequential data collection through two stages, first exploring scenarios (Dinka and Lundberg, 2006) which are analysed to conduct the data collection in the second stage. The study adopts a

three-horizon approach (Sharpe et al., 2016) to help guide the research participants around complex problems and uncertain futures of BUW.

The study takes a loose case study approach (Yin, 2003, Hays, 2004), in which the BUW as a whole can be considered the main case study, with focus on three waterway communities in Bangkok, capturing the various site contexts (Frantzeskaki et al., 2023). Policy analysis (Winton, 2013), historical maps and archival study (Selman, 2012), and map analysis (Baker, 1989) provide important desk work to understand the physical geography of the study.

Borrowing an ethnographic approach (Ritchie et al., 2013) in this research provides rich data in understanding stakeholders' attitudes, values and perceptions around BUW. Thus, the research delves into various aspects, including the role of local residents from three communities as primary waterway users and original settlers, the government agencies' approaches employed in BUW, as well as the contributions of practitioners, academics, and non-governmental organisations (NGOs).

This qualitative research design leads to data collection using semi-structured interviews (Rabionet, 2011) and go-along interviews (Rishbeth, 2020), including focus groups (Nyumba et al., 2017), which are conducted with multiple stakeholders, as well as site surveys (Mulhall, 2002) undertaken in the community area. The focus group or collaboration workshop calls on diverse expertise of participants to explore the decision-making process (Choo, 2002) and the integration of knowledge (Fazey et al., 2014) regarding BUW management. The role of landscape value is of interested (Lele et al., 2023) in these workshops, and the consideration of stakeholders (Dobson and Dempsey, 2021) to different alternatives is also explored. The study applies thematic analysis (Braun and Clarke, 2020, Felstead and Thwaites, 2023) via Nvivo Software (Meehan, 2021) through an abductive strategy (Thompson, 2022) to analyse the data from interviews and focus-groups.

1.8 Thesis structure

This thesis is structured into eight chapters:

Chapter 1 starts by introducing the significance and potential contribution of this research, explaining why this topic matters in the realm of academic study, including the scope of work. The research questions are presented, followed by a brief presentation of the research methodology to address these gaps in knowledge, ending with a summary of the thesis structure.

Chapter 2 provides a comprehensive review of the literature globally and in Thailand to demonstrate the gap in knowledge. It describes what is meant by the landscape approach and landscape values, the complexity of urban water-related landscapes, governance in the context of changing water-related landscapes, and varied concepts, including governance, participation and public involvement, with their theoretical underpinnings.

Chapter 3 outlines the methodology employed in this study, with the philosophical basis underpinning social constructionism within a qualitative approach. The research design of

case study and borrowing from the ethnographic approach are described. The chapter then describes the iterative approach and sequential data collection process of interviews and focus groups, including considerations of researcher positionality. The data analysis process is rigorously explained in the subsequent section, along with details on research ethics and integrity. The chapter ends with reflections on fieldwork and the study's limitations.

Chapter 4 provides an in-depth look at Bangkok Urban Waterways, offering a foundational understanding of the context. This chapter amalgamates data gathered from desk reviews and fieldwork, comprising two main sections. The first section gives an overview of BUW, contextualising the management structure. It delves into specifics of institutional heritage sites and flood control measures, highlighting who is involved in their execution. The chapter then chronicles the historical evolution of waterways from ancient times to present day and concludes by delving into the details of the study sites at the neighbourhood level.

Chapter 5 unveils the initial findings derived from the fieldwork analysis. It delves into the transformation of BUW, probing the intricate nuances of change and scrutinising the (in)effectiveness of institutional mechanisms associated with these transformations. The chapter also highlights diverse stakeholder perspectives and their preferred management approaches, shedding light on the values they uphold and examining the alignment of these values in management processes.

Chapter 6 presents the findings from the second stage of fieldwork. It commences by further exploring the analysis of values within the landscape and their influence on shaping decision-making processes. The chapter compares the role of values in landscape management between individual tasks and collaborative efforts from stakeholder engagement. Additionally, the chapter explores the construction of knowledge through collective sharing and examines the rationale behind considering various management alternatives or solutions.

Chapter 7 discusses the empirical data from fieldwork, bringing and analysing findings together with the literature. Here, changes and complexities in BUW and their governance contributions are discussed. The chapter highlights agency communication and meaningful participation processes. The role of landscape knowledge in BUW management and local knowledge are underlined, together with transformations in landscape values and the dilemmas in the decision-making process. It ends with proposing an example of collaboration.

Chapter 8 provides the conclusion of the thesis, examining the contribution that this research makes to knowledge before giving recommendations around future change. The chapter ends with the potential to make this recommendation happen in terms of future practice and academic research, including the proposing future research.

All diagrams presented in the thesis are generated by the researcher unless otherwise specified. Similarly, all photographs are captured by the researcher, and if not, their sources will be duly credited.

Chapter 2 Literature Review

2.1 Introduction

This chapter explores international and Thai academic literature to understand and identify gaps in the research. This begins by providing an overview of the landscape approach in design and planning. It also examines the value of landscapes considering water and offers real-world examples of landscape conceptualisations implementation, including studies conducted in Bangkok (Section 2.2). Section 2.3 focuses on the complexity and change of landscapes in urban settings, including those related to water-issue and waterway-adjacent areas, before addressing a flooding incident and uncertainty. This ends with discussions on frameworks for studying changes and complexities in urban landscapes. Section 2.4 discusses how landscape governance can influence changes and values and provides existing studies in Bangkok's governance and political economy, including studies in flood controls and heritage practices. Section 2.5 explores collaboration and multi-stakeholder efforts, examining knowledge and values in decision-making processes, local knowledge, and participation procedures. The chapter ends by providing a comprehensive summary of how the literature identifies the main research questions (Section 2.6).

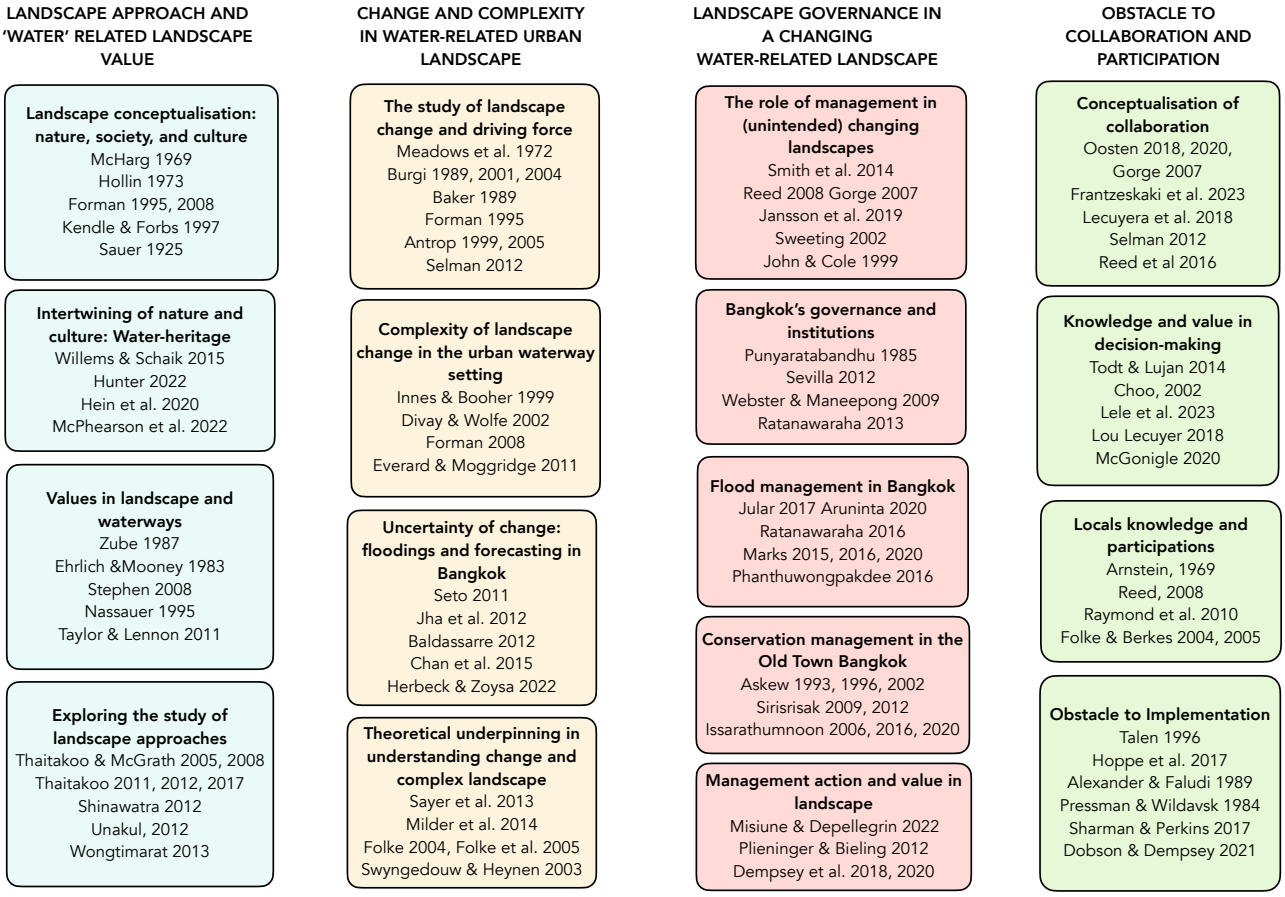


Fig 2-1 The clustering of literatures for reviewing

2.2 Landscape approaches and 'water' related landscape value

2.2.1 Landscape conceptualisations: nature, society, and culture

The landscape approach embodies interdisciplinarity (Milder et al., 2014, Doherty and Waldheim, 2016), contextual interests, and holistic scales (Sayer et al., 2013). This approach considers various dimensions, including natural features, human activities, culture, and socioeconomic factors, acknowledging the complexity (Freeman et al., 2015) that is shaped by interactions between humans and the environment (Forman, 1995, Forman, 2008). The landscape conceptualisations (Section 2.2.1 and 2.2.2) are collectively referred to under the umbrella of the landscape approach. Further discussion on the landscape approach is provided in Sections 2.3.4 and 2.5.

The focus on landscape conceptualisation aims to explore the landscape approach within the context of design and planning, specifically examining their acknowledgement of the historical and contemporary value of landscapes. This will be later investigated in Bangkok considering waterways.

A notable figure who contributed significantly to the development of landscape conceptualisation from natural standpoints is Ian McHarg, particularly through his influential work "Design with Nature" (1969). McHarg emphasises the importance of considering the interaction between humans and nature in landscape design and planning. His concept underscores the intrinsic relationship between human activities and the natural environment, advocating for a more harmonious and sustainable approach to land use (McHarg, 1995). Meanwhile, Forman's work in landscape ecology and planning, particularly "Land Mosaics" (1995) significantly advances understanding of the landscape approach by introducing the importance of landscape patterns and their ecological significance, advocating for the consideration of landscapes as complex mosaics of different land cover types (Forman, 1995). Kendle and Forbes (1997) outline the importance of conserving nature in urban areas, highlighting the need to restore and strengthen the connection between humans and nature in the context of cities and towns (Kendle and Forbes, 1997).

These scholars highlight the significance of understanding and leveraging natural processes and patterns inherent in landscapes to create resilient and ecological design and planning. Many landscape conceptualisations have emerged and evolved within the realm of 'sustainability', such as Sustainable Development Goals (SDGs), the concept of resilience (Holling, 1973), and Nature-Based Solutions (NBS) (IUCN, 2021).

The landscape element of 'water' holds immense importance as a vital and intricate component of the overall natural ecosystem, functioning as a complex hydrological structure (Forman, 1995). In recognition of its pivotal role, numerous landscape conceptualisations have emerged with a primary focus on addressing water-related challenges and opportunities. For example, water resilience is increasingly implemented through ecological and technological methods like bioswales, green roofs, and retention ponds to enhance a water system's ability to withstand challenges (McPhillips et al., 2022), landscape infrastructure and blue-green infrastructure is introduced to amalgamate "green"

components such as parks with “blue” elements like rivers, lakes, and reservoirs (McPhearson et al., 2022).

From a social and cultural standpoint, many conceptualisations have developed, enhancing the relationship between landscape and human settlements. The term **‘cultural landscape’**, first defined in the 1890s and introduced by Carl Sauer in 1925, means the geographic area in which the relations between human activity and the environment have been created (Denevan and Mathewson, 2009). It gained traction following UNESCO’s declaration in 1992 in the category of “World Heritage Cultural Landscapes,” following their 1972 World Heritage programme (UNESCO, 2010). The programme aims to recognise and protect cultural and natural heritage sites of outstanding value. The term **heritage or cultural heritage** describes sites or assets that contain both physical and intangible significance, universally valued and thus deserving preservation for future generations (Taylor, 2018). Simultaneously, UNESCO marks a significant shift away from the exclusive focus on monuments and sites within the discourse of conserving cultural heritage in the context of global conservation frameworks (Mitchell et al., 2009).

Later, UNESCO (2011) outlines the concept of Heritage Urban Landscape (HUL) as a recommendation (UNESCO, 2011). This approach goes beyond the limitations of safeguarded conservation areas or specific parts of a city. Instead, it encompasses the entirety of the city, including its various processes and dynamics, in a holistic manner (Taylor, 2018). This shift underscores the increasing importance of human communities and their role in shaping the living history of these landscapes (Taylor and Lennon, 2011). The way in which this applies to Bangkok will be explored later.

2.2.2 Intertwining of nature and culture: Water-heritage

The book ‘Water and Heritage’ by Willems and Schaik (2015) underscores the profound significance of water and its history, emphasising its importance in terms of both natural and cultural heritage, including a discussion of the impact of water-related hazards and climate change. The study highlights the need to safeguard such heritage in the face of modern challenges and draws attention to the dynamic relationship between societies, water management, and governance. Their work highlights a need to raise awareness of contemporary values and current uses of water-related heritage (Willems and Schaik, 2015). The term ‘water-related heritage’ indicates that the scope extends way beyond considering just elements of water in the landscape but has contributed towards shaping entire settlements (Jigyasu, 2015).

Hunter (2022) uses the term 'Water infrastructural heritage' to refer to the management of historical, cultural, and physical assets associated with water management and infrastructure. It includes structures and systems like dams, canals, and water treatment plants, which hold historical, architectural, and cultural value. This term presents the significance and challenges related to the civil infrastructure of water in supporting modern society. His work highlights how this requires water managers and preservationists to cooperate, emphasising the idea that water does not recognise political borders, so people must come together to address these challenges. However, there are problems in reality, such as difficulties in preserving

water heritage, where water management meets historical conservation (Hunter, 2022). This will be explored in the context of waterways in Bangkok.

Unakul (2022) uses the term 'Heritage-based solution' to support landscape concepts, such as NBS. Her study highlights that heritage involves both natural and cultural elements, indicating that solutions rooted in heritage draw upon both natural phenomena and cultural traditions and wisdom. Historical architectures, communities, and environments were crafted with a profound awareness of pre-existing natural systems, including those concerning land, water, and climate. In the past, water management depended on the landscape, gravitational forces, and seasonal fluctuations with the aid of basic mechanics. This stands in complete contrast to the current engineering mindset, which often extensively combats natural forces, often resulting in approaches that are ultimately unsustainable (Unakul, 2022).

According to Hein et al. (2020), the complex and evolving relationship between water and heritage in the Netherlands is associated with various water management aspects, including engineering, infrastructure, and historical structures. Two distinct recognitions persist: one focuses on maintaining water infrastructure in its original form as a significant cultural asset. The Dutch region's close-dyke human-control base serves as an example, where longstanding and unsustainable practices persist. On the other hand, the other recognition of emerging trends in water heritage takes a novel approach that transcends chronologically physical constraints, even in the face of opposition from conservationists who advocate maintaining things in their traditional historical state (Hein et al., 2020).

In this regard, the term **'adaptability'** emerges. This is a common thread woven through the literature and implemented projects (Section 2.2.1). In an ecological context, this term is intertwined with 'resilience', defined as the capacity of an ecosystem to endure disturbances and maintain its fundamental structure and functions (Holling, 1973).

In terms of design planning implications, adaptability is about making informed and flexible choices about how land is used to ensure that it remains functional, efficient, and able to adapt to evolving circumstances. For instance, adaptive land use refers to a planning approach that considers the dynamic and changing nature of a region's environmental conditions in response to various challenges and uncertainties (Hein et al., 2020). This includes strategies like zoning changes, urban planning that accounts for climate change impacts, and incorporating green spaces and landscape infrastructure into urban development to mitigate risks like flooding (McPhearson et al., 2022). The term adaptability is revisited in Section 2.4.

2.2.3 Values in landscape and waterways

This section reexamines the relationship between humans and the landscape, focusing on how humans, acting as agents, have altered the landscape for their benefit. At this juncture, the term 'value' is briefly introduced and later examined in greater detail.

According to Zube (1987), 'landscape value' takes meaning from the economic interpretation – the relative worth, discussing value in terms of the dimensions of 'needs and desires' for the landscape (Zube, 1987). The value of landscape is the way humans interact and associate

with the environment. This human interaction of form and practice with natural resources has occurred since ancient times. The understanding of the human and landscape means that individuals and groups attribute to the values they hold for the landscape (Stephenson, 2008, Nassauer, 1995).

Landscape value has become apparent as early settlers chose to inhabit specific regions to harness their advantages. Features like **'waterways'** as landscape elements hold particular significance in the realm of ecosystems (Ehrlich and Mooney, 1983). The natural landscape of waterways, rivers and coastlines offers valuable ecosystem services, e.g., food production (Schmutz and Sendzimir, 2018). Moreover, floodplain resources naturally emerge from these ecosystems' ecologies (Cengiz, 2013), and elements of the rivers have been instrumental in determining the siting and growth of vernacular cities (Pattacini, 2021). This history informs the expectations and perceptions of what the future holds for these landscapes (Zube, 1987).

People all over the world have actively participated in reclaiming and altering various elements of the natural landscape since the early stages of settlement (Denevan and Mathewson, 2009). These efforts to modify landscapes have yielded numerous advantages for humanity, and their value has become an integral part of these transformed environments (Taylor and Lennon, 2011). Simultaneously, human has engaged in the reclamation and alteration of landscape elements to suit their needs and objectives. However, landscapes have been modified to the extent of damage as an urban settings experience accelerated change, leading to a decline in the values that were once intertwined with human activities (Zube, 1987).

Landscape conceptualisations (Section 2.2.1 and 2.2.2) share significance, centred around the importance of 'landscape value'. They serve as guiding principles not only for a more holistic approach but acknowledge that the **'value'** rooted in landscapes benefits human interaction with the environment, fostering this relationship not only historically but also in the contemporary era (such as Forman, 1995). For instance, conceptualisations like water heritage emphasise the significance of the restoration process and the reconnection between humans and nature, thereby enhancing landscape value (Willems and Schaik, 2015).

Meanwhile, while landscape approach acknowledges that their efforts, such as ecological restoration are often viewed as costly, partially successful, and challenging to assess in terms of outcomes, it contends that its true value lies in the process itself rather than the results (Kendle and Forbes, 1997).

Dunham et al. (2018) indicate that recognising and having faith in the potential of natural landscapes is a fundamental aspect of attaining sustainability and resilience objectives for our planet. These values play a significant role in shaping the decisions and actions taken by individuals and institutions, ultimately influencing how we envision the future of landscapes (Dunham et al., 2018).

The term **'value'** will be revisited later in the context of change and management (Section 2.3), and positioned within knowledge and decision-making (Section 2.5). This landscape approach and the component of landscape value will be investigated in their role in the context of waterways in Bangkok.

2.2.4 Exploring implementation and study of landscape approaches

Over the years, studies have delved into the potential of incorporating landscape approaches and conceptualisations into Bangkok City and other cities, with numerous international studies and examples of this comprehensive approach implemented in practical settings, underscoring the emphasis placed on the value of water in their landscapes.

For instance, the UK's TE2100 Project (2009) focuses on flood risk management in the Thames Estuary, prioritising geographic and environmental factors rather than the municipality boundary (Chan et al., 2015). In the Netherlands, "Room for the River" (2017) has widened rivers to reduce flood impact (Daisi, 2012, IUCN, 2021, McPhillips et al., 2022), embracing a "water heritage" approach (Hein et al., 2020). Amsterdam (Fig 2-2) integrates soft structures into its water management (Manzini et al., 2022), including canals helping mitigate surface flooding and improve efficient water flow (Holthuijsen and Ouboter, 2021). New York City rebuilt post-Superstorm Sandy using "blue-green infrastructure" (Unakul, 2022). China's Sponge City initiative, exemplified in Suzhou, integrates natural and built elements for sustainable water management (McPhillips et al., 2022).

These recent landscape approaches also demonstrate a move away from solely relying on human-controlled or structured measures of massive engineering projects like dykes and surge barriers, previously seen in the UK and Netherlands. These inadequacy of relying solely on such methods to address anticipated changes in flood events due to climate change has been acknowledged (Chan et al., 2015, Rongwiriyaphanich, 2014).



Fig 2-2: Amsterdam green city concept's plan (Left), The waterways in Amsterdam (Right)
Source: https://www.amsterdam.nl/en/policy/ accessed in November 2023

In Bangkok, several studies are considering the landscape approach in the realm of waterways and water management. For example, the recommendation of occupying landscape infrastructure with Bangkok's waterways highlights the use of water transportation as an efficient system to improve urban connectivity (Iamtrakul et al., 2018, Unakul, 2012, Hossain and Iamtrakul, 2007). These studies emphasise the potential of creating a network of open and recreational spaces within the urban landscape (Chansiri, 1999), including the possibilities offered by the riverfront along the Chao Phraya River (Srirojanapinyo, 2003). Furthermore, site-based studies have illustrated how waterways can serve multiple functions. These include

the potential for restoring functions in the historical waterway of Rob Krung Canal (Gajaseni, 1998), developing multipurpose applications for the Sanseab Canal in the inner zone (Pattarasumunt, 2021), and exploring the canals in western Bangkok (Patarakiatsan, 2012).

The place of 'nature' in the landscape approach has been a recurring theme in both research and design projects. A significant academic contribution is the work of Thaitakoo, McGrath, and their research teams. They have studied the context of Bangkok illustrating the impact of urban sprawl and considering the hydrology system. Their studies have focused on changes in the urban landscape, highlighting shifts in hydro-agricultural landscapes or traditional orchard patterns – this cultural landscape includes ditches or manmade minor waterways (McGrath and Thaitakoo, 2005, Thaitakoo and McGrath, 2008, Thaitakoo et al., 2012).

Their studies later underscore the importance of deliberating on landscape ecology in the context of climate change, introducing the concept of 'liquid perception' (Thaitakoo and McGrath, 2010) and considering local knowledge, i.e., the agricultural process of orchard garden, for climate adaptation in the face of flooding incidents in the Chao Phraya River Delta (Dahiya and Thaitakoo, 2011). The study enhances the significance of the ecological flow of water as a distributary system (McGrath et al., 2015), including emphasising the significance of the urban ecosystem and evolving towards landscape ecology and the cultural dimension, promoting landscape sustainability and resilience (Thaitakoo, 2017, Thaitakoo and McGrath, 2017).

Other studies have been conducted related to potential areas based on their specific site characteristics, such as Ladkrabang, a floodplain area, considering amphibious architecture (Nilubon et al., 2016), and Nongchok, an agricultural area with a focus on ditch and dyke design to mitigate flooding (Suksawang, 2012). Meanwhile, studies conducted in the field of urban landscape planning focus on landscape infrastructure conceptualisation to address flooding issues. Examples include studies conducted in the inner zone of Sanseab Canal (Surajaras, 2019), the eastern downtown commercial district of Phatumwan (Thienvutichai, 2019), and Ladprao Canal (Ramkisor, 2016).

The landscape approach of the water heritage dimension has also been academically studied, considering the historical context of the traditional Thai lifestyle of locals, exemplified in significant senses of neighbourhood identity along the waterways. Examples include studies of communities along the canals: the Khlong Bangkok Noi and Bangkok Yai community (Wongtimarat, 2013, Tantinipankul, 2012), Khlong Khu Mueang (Rittitid, 2017), and Khlong Ong Ang (Khunthong and Sukolratanametee, 2020). These studies recommend comprehensive guidelines focusing on the heritage importance of locals within an urban context.

Unakul (2012) explores the potential of reconnecting heritage waterways to benefit the modern city in the context of flooding incidents and urban functions like open spaces and canal transportation (Unakul, 2012). Meanwhile, the recommendation of 'living with water' is addressed by Shinawatra (2012) to address flood mitigation. She recommends encompassing the cultural landscape concept into urban planning by adopting a 'building open ground' strategy as a solution to addressing flooding problems, drawing upon local

knowledge and a cultural landscape approach, illustrated through the case of Kadeejeen, once a village of raft houses (Shinawatra, 2012). Aruninta (2013) concentrates on the scale of the Chao Phraya Delta, recommending practices for future flood mitigation that address the "meaning and spirit of the cultural landscape" as guiding principles (Aruninta, 2013).

Similarly, Casper (2015) explores the use of the term 'amphibian identity' as an urban development principle through the canals in Bangkok. His work suggests the multifunctionality of canals to adapt urban form to innovative uses. He explores the spatial pattern of canals and indicated the potential as integral parts of the urban fabric. His analysis considers flood mitigation issues and underscored the significance of heritage, such as the markets and vernacular architecture along them (Casper, 2015).

These examples have greatly enriched the understanding and contributed to landscape planning in Bangkok. However, despite their thorough investigation of ecological and hydrological dimensions, including consideration of adaptability and cultural landscape in urban design and planning, these recommendations have never been applied in practice.

The extent to which the current management by the public sector differs from these landscape alternatives remains unjustified, and the reasons behind this disparity warrant further exploration. This requires an investigation into the institutions that can explain why these suggestions have not been taken into account. A study at the local scale is also necessary to rigorously understand the relationship with real users. In this thesis, BUW is being used to investigate and fill this gap in knowledge.

2.3 Change and complexity in water-related urban landscapes

2.3.1 The study of landscape change and driving forces

Landscape changes refer to the dynamic transformation in an area's physical, biological, and cultural features over time. It is driven by natural processes such as climate shifts, as well as human activities such as urban development or agriculture production, reflecting the evolving interactions between humans and their environment (Bürgi et al., 2004). For instance, this includes the transformation of land use and water systems (Forman, 1995).

The study of landscape change has its origins in ecological knowledge and modelling. Baker (1989) delves into modelling landscape change using spatial models, emphasising its importance in the field of geography (Baker, 1989). Forman's studies, on the other hand, focus on understanding the ecological processes (Section 2.2.1) underlying landscape transformation. His works describe landscapes as compositions of diverse patches with different characteristics, such as waterways, which change over time. These patches are interconnected, meaning that changes in one element can impact other elements within the ecological system as a whole (Forman, 1995).

Meanwhile, the features of spatial and temporal change in landscapes have subsequently been widely explored and applied. For example, tools like Land Use Land Cover (LULC) or Global Human Settlement (GHS) from remote sensing and geographic information have been

extensively used to analyse changes in land characteristics through spatial investigations (Esri, 2021, GHS, 2018). This mapping data has made a major contribution to a further range of research, measuring the trend of urbanisation and the overall increase in impervious surfaces (Everard and Moggridge, 2011).

Researchers investigating the processes of landscape change include Nassauer (1995), Antrop (1999, 2005), and Burgi (2004). The concept of driving forces defines qualitative understanding, comprising socioeconomic, political, technological, natural, and cultural factors, and has been used to explain the process of landscape change (Bürgi et al., 2004). Understanding these factors aids in addressing data comparability challenges in interdisciplinary approaches (Antrop, 2005). Culture has also been recognised as a key driver of landscape change, as humans have altered landscapes to meet their needs, such as transforming the landscape for territorial or agricultural purposes (Nassauer, 1995). Forman's work discusses human-induced changes in landscapes and highlights the ecological consequences of six major land transformations: deforestation, suburbanisation, corridor construction (e.g., irrigation canals), desertification, agricultural intensification, and reforestation (Forman, 1995, p. 417).

As landscapes exhibit ecological dynamism (Forman, 1995), their characteristics and locations of change can be highly distinct, necessitating customised strategies informed by a thorough comprehension of their historical development and future trajectories. Therefore, the study of how landscape has been changed historically is essential in this regard (Antrop, 2005, Selman, 2012). It introduces a connection between what ecologists call 'the human impact' and what historians describe as 'the primary group of actors influencing landscape transformation' (Bürgi and Russell, 2001, Zube, 1987). This shapes the methodology in this research (Chapter 3).

Studies in Bangkok have identified significant changes in built-up areas predominantly through the mapping process. The studies have contributed to the understanding of urban issues such as decreasing green areas from urban sprawl (Angel et al., 2007), causing heat island intensity (Khamchiangta and Dhakal, 2020, Nantavisai and Thaitakoo, 2023), and changing ecological biodiversity (Thanapet and Kung, 2015), including a fragmented agricultural pattern in the orchard system that has resulted in urban hydrology patterns (McGrath and Thaitakoo, 2005, Thaitakoo et al., 2018). Meanwhile, the mapping study investigated the historical pattern of waterways and addressed the associated pattern alteration (Broadhurst, 2017).

While these pieces of research have mainly focused on tangible occurrences, they have not thoroughly examined the underlying reasons for these complex changes in Bangkok and have yet to pay more detailed attention to the landscape of the waterways. Further investigation of the reasons and processes, or driving force, for these changes are examined in this thesis, partly taking a historical approach.

2.3.2 Complexity of landscape change in the urban waterway setting

Scholars have explored the complexities of change in urban settings and metropolitan areas, highlighting that the causes of change cannot be easily pinpointed because interventions have

ripple effects in the system that are only partly observable. Even minor alterations introduced into the system can lead to unexpected and discontinuous consequences (Martine, 2011, Forman, 2008).

Regarding water issues, Innes and Booher (1999) explain the example of a complex change in the hydrology regime in urban settings generally. The alteration from urbanisation has led to disrupted stream flow and an increase in impervious surfaces coupled with engineered urban drainage systems. Moreover, the extensive sprawl across the landscape has resulted in natural resources becoming inadequate and declining, i.e., low water quality in water resources, to meet the needs of the settlers. This also leads to the population becoming disconnected from nature. At the same time, infrastructure systems, such as drinkable water supply, have struggled to keep up with urban expansion, resulting in vulnerable and inadequate public services. In impoverished regions, inadequate water and sewage systems are also detrimental to public health, harm the environment, and increase vulnerability to disasters, especially in Asian megacities. Enhancing water supply without simultaneously improving sanitation can exacerbate surface water drainage and waterborne diseases (Innes and Booher, 1999).

Turning to waterway-adjacent areas, Laquian's work (2011) examines the transformation of ecologically vulnerable areas, including watersheds, within densely populated urban environments. The 2017 UNEPA report highlights that urban expansion in developing countries, particularly in Asia and Africa between 2000 and 2030, primarily involves low-income individuals. For instance, a significant influx of migrants relocated to urban centres in search of employment opportunities. Consequently, in these densely populated urban areas, where housing options are limited, these populations often settle in ecologically fragile areas, watersheds, and waterway-adjacent areas. This not only puts their lives and property at risk but also increases the vulnerability of the city to flood damage (Laquian, 2011).

The occurrences of landscape transformation in major cities, including riversides, are recognised globally. These urban rivers play a significant role in urban development. For instance, many cities once effectively turned their backs on waterways, using them primarily as sewers. However, they are now revitalising their waterfront areas by transforming canals, harbours, and docklands into commercial spaces to boost the cities' economies (Marshall, 2001). At the same time, in the pursuit of economic investment and urban development, there has been neglected of the existing landscape character and surroundings. Traditional areas are often replaced by new office towers and hotels, typically enclosed and guarded. Industrial, commercial, and modern residential uses frequently fail to consider their relationship with the physical features of the landscape, such as topography, flood plains, and natural hazard zones, diverging from historical practices (Divay and Wolfe, 2002).

Moreover, areas renowned for their historical significance, such as heritage riverside areas and water cities, have experienced a significant increase in tourist visits and infrastructure development to support heritage tourism and economic growth (Harrison, 2013). This has led to a complex interplay of challenges involving the need to conserve heritage sites while meeting the demands of growing tourism (Porfyriou, 2019). Consequently, this ongoing dynamic brings about notable changes in both the sociocultural fabric and physical features of the landscape (Taylor and Lennon, 2011). Additionally, the presence of ecologically

vulnerable areas primarily inhabited by lower-income individuals can be attributed to shifts in social structures within local communities, often influenced by gentrification (Taylor, 2018).

These complex matters related to landscape, waterway-adjacent areas, and water issues are being investigated in the context of BUW. The thesis seeks to explore the extent to which Bangkok's context and its transforming waterways align with the phenomena described above.

Existing research on Bangkok illustrates the change of land use regarding waterway-adjacent area. Toiguchi et al. (2002) describe changes in settlement patterns in four Bangkok canal-side areas between 1952 and 1998. The study addresses a shift from traditional to modern building styles and materials connected to changes in settlement structures. This transformation varied in duration, taking over forty years in urban fringe areas like Sai Gong Din in eastern Bangkok, and twenty years, considerably shorter, in the central business district like Mahasawat in western Bangkok (Tohiguchi et al., 2002).

Davivongs' studies highlight the deterioration of Bangkok's western canals from the indigenous irrigation system. The study indicates that land ownership plays a considerable role in the change to the canals, particularly in the actions of filling and covering minor canals by the developers who favour larger portions of properties (Davivongs et al., 2012). This has sparked conflict between local farmers and real estate developers, ultimately transforming urban areas in western Bangkok (Davivongs and Arifwidodo, 2020).

Unakul (2012) delves into the historical aspects of waterways and highlighted the changing patterns in urban waterways, including issues like inaccessibility to canal-side areas. Her study points out that urbanisation had led to encroachment, underutilisation, and fragmentation of canals (Unakul, 2012), which influenced the poor drainage capacity in Bangkok (Marks, 2015).

These investigations offer an understanding of changes in Bangkok's waterways. Further exploration is conducted in the thesis, particularly focusing on the waterways as complex landscapes within the context of local communities, including ownership dynamics, the underutilisation of canals, and the broader land use context related to BUW.

2.3.3 Uncertainty of change: floodings and forecasting in Bangkok

As highlighted by the UN and The World Bank, data underscore the substantial effects of climate change, making evident the risk and vulnerability of coastal cities to factors such as sea-level rise and topography (Jha et al., 2012, Worldbank, 2012). Over half of Asia's population resides in coastal regions, and in East Asia alone, there are more than 325 million inhabitants living in low-lying coastal areas prone to flooding. Moreover, many of these regions are anticipated to become even more vulnerable in the near future due rising sea levels, putting millions of people and their economic assets at risk from floods and storms (Chan et al., 2015).

This is exacerbated by significant population increases primarily occurring in exposed areas like deltas, estuaries, coastal zones, and coastal cities in Asia (and Africa) due to improved employment and educational prospects (Herbeck and Zoysa, 2022). By the 2070s, over 20

cities in East Asia will face substantial exposure to coastal flood risks, one of including Bangkok. The impact of flooding in such geographical settings can result in significant damage to society, the economy, the environment, and loss of human lives (Jha et al., 2012).

The flooding incidents in China and Pakistan in 2010 resulted in the loss of over 8,000 lives and impacted approximately 180 million individuals (Baldassarre, 2012). The term 'flood hazard' implies that when humans experience adverse effects from a flood event, it is defined as an impact rather than a natural occurrence (Malatesta, 2013). The concept of hazard, including flood hazard, revolves around the idea that floods are not considered hazardous unless they somehow affect human activities (Parker, 2000, Malatesta, 2013, Baldassarre, 2012).

In urban settings, floods do not result from isolated factors but rather from a combination of factors in the complex urban environment, as discussed in Section 2.3.2 (Divay and Wolfe, 2002, Laquian, 2011). They can have been caused by both natural catastrophes (Baldassarre, 2012) and the modification to the landscape by humans (Forman, 1995). For example, Greater Jakarta has drawn attention due to significant infrastructure challenges, including widespread flooding from extensive population growth and expansion of its urban territory including annual land subsidence from urban development (Worldbank, 2011, Colven, 2023). Similarity, Ho Chi Minh City faces similar problems of potential future flooding due to being a low-lying and rapidly growing metropolis (Lempert et al., 2013).

In regions such as the Netherlands and the United Kingdom, flooding predominantly results from storm surges originating from the North Sea, which pose a significant threat. These surges are characterised by unusually high sea levels caused by weather conditions, such as strong winds and low atmospheric pressure, leading to coastal or river flooding (Baldassarre, 2012). They are also referred to as tidal floods or high water as Venice used these later terms (Munaretto et al., 2012). Surface flooding occurs when heavy rainfall affects urban areas, overwhelming drainage systems and inundating streets and low-lying areas, often leading to localised flooding events (Holthuijsen and Ouboter, 2021). Similarly, flash floods are associated with extreme rainfall events in the summer months, such as those in the UK, caused by intense torrential storms (Jha et al., 2012).

In monsoon coastal regions, floods in cities like Jakarta, Ho Chi Mihn City, and Bangkok, **seasonal floods** or monsoon rainfall (Forman, 1995) are the most common, typically occur from rainfall and the overflow of water from upper delta regions flowing through the cities. They are also influenced by rising sea levels along the coastal areas (DSD, 2011). **River floods** can occur independently, caused by water level overflow along the riverbanks. Flooding during seasonal floods can be called **significant floods**, as they are tied to the amount of ongoing rainfall that persists for months and are caused by the blockage of water (AON, 2012). **Urban floods** are triggered by heavy rainfall and are closely linked to the drainage capacity within urban areas, which can coincide during the seasonal rainfall (Thanvisitthpon et al., 2018). In Bangkok, urban flood, called vulnerable flood areas, is classified as less than 24 hours of duration (BangkokGIS, 2019). This thesis concentrates on flood events that take place in Bangkok, using the terms and concepts described in this paragraph.

Studies conducted in the Chao Phraya Delta have aimed to document the impacts of climate change and flooding. For example, Duangyiwa et al. (2015) use mapping techniques to produce future scenarios to 2100, focusing on coastal Bangkok in the Gulf of Thailand. Their research highlights the potential impact of climate change where the flooding will be severe in 100 years (Duangyiwa et al., 2015). Additionally, Swiss Re produces a report with a mapping process showing the risks and consequences of flooding in the Chao Phraya Delta. This report emphasises that flooding has a global impact due to the presence of foreign manufacturing facilities in flood-prone areas (Schwarz and Tanyaphituck, 2015).

Gale and Saunders (2013) measure the climate causes and return period of flood impact in Thailand. The study notes that the likelihood of a flood in Thailand as severe as the 2011 event can be estimated in three ways, which all indicated that Thailand may face another significant flood event within the next two to three decades unless enhancements are made to flood defences and management strategies (Gale and Saunders, 2013).

Their research provides robust scientific evidence of the potential flooding impact in the Chao Phraya Delta. It shares a common objective of assisting authorities in making informed decisions to economically safeguard critical infrastructure and assets, as well as addressing concerns about flood defences and management. This underscores the need for further investigation into the extent to which enhanced infrastructure and flood defences are incorporated into decision-making processes and how BUW play a role in those plans/policies.

2.3.4 Theoretical underpinning in understanding change and complex landscape

In this section, two frameworks, Social-Ecological System (SES) and Urban Political Ecology (UPE), are reviewed to understand the complexity and change in the landscape considering slightly different positions (Fig 2-3). The section ends by describing why this research takes **'landscape approach'**.

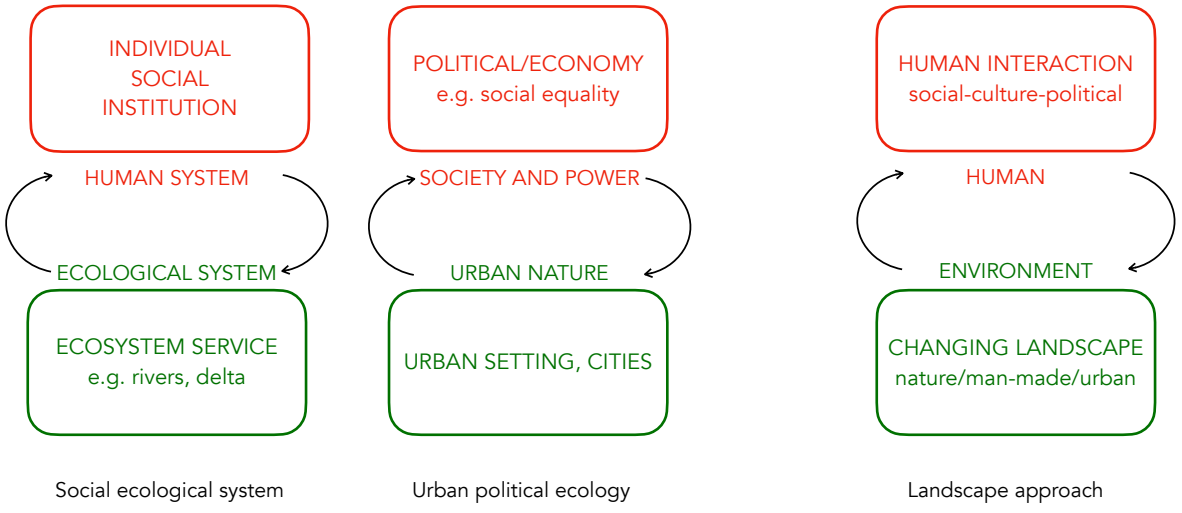


Fig 2-3 Conceptual diagram of SES, UPE frameworks, and Landscape approach

Social ecological system (SES)

The SES highlights the interconnectedness and mutual influence between social and ecological elements within a complex system. It emphasises the need to consider both human and environmental factors when studying and addressing complex issues. SES recognises that social and ecological systems are interlinked, and that changes or actions in one system can have significant impacts on the other. This framework is particularly useful for understanding how governance and institutional arrangements can affect human-environment interactions and sustainability (Folke, 2004, Folke et al., 2005, Berkes et al., 2000).

Additionally, SES shows apparent overlap with a conceptualisation of landscape approach (Fig 2-3), notably within the spatial landscape perspective in the geography context. It considers the geographical landscape as having relationships with both social structure and the environment (Stenseke et al., 2012). Moreover, within the context of this SES framework, the concept of traditional ecological knowledge has been identified and has influenced the consideration of the community-based dimension (Berkes, 2004). This is discussed more in Section 2.4.

Dunham et al. (2018) identifies the importance of the SES framework to river landscape studies. Their study shows that SES can provide a more comprehensive approach to riverscape ecology and management by incorporating human dimensions – values, governance, and stakeholders. The study highlights how SES bridges the gap between natural and social sciences in understanding and managing river systems (Dunham et al., 2018). Schmutz and Sendzimir (2018) applies the SES framework to study how human interventions and social processes in management affect riverine landscapes. Their work demonstrates that the rate and magnitude of dam construction and other types of river alterations influence the extent of adverse effects on aquatic plants and animals (Schmutz and Sendzimir, 2018). It is worth noting that the BUW, characterised by a blend of natural and man-made features, differs somewhat from the ecological and natural landscape of rivers or catchments, as the thesis demonstrates.

Urban political ecology framework (UPE)

UPE is a cross-disciplinary area of research that centres on the intricate connections between cities, the natural world, and human society. It originally developed from Political Ecology while UPE delves into how politics, economics, and societal interactions shape, and indeed are shaped, by concentration in the landscape of an urban setting (Swyngedouw and Heynen, 2003), unlike SES which focuses more on ecosystems.

This UPE framework rejects the separation of the environment and the urban. Instead, it views (e.g.) disasters as complex occurrences that entail cascading consequences with feedback loops affecting both local and broader political economies. Viewed through the UPE lens, it can examine, for example, how the global economy influences city development, why urbanisation can render cities more vulnerable to natural disasters, how cities depend on and change the natural landscape, and the investigation of traditional notions of state governance in shaping urban landscapes (Swyngedouw and Heynen, 2003).

Landscape elements like 'water' in urban settings are also taken into account, acknowledging intricate landscape elements within the urbanisation context. The framework allows scholars to delve into the intricate connections between water resources, governance, and the urban landscape. It scrutinises how political and economic variables impact access to water, its distribution, and the resulting environmental effects in urban regions (Swyngedouw et al., 2002). As a result, studies in urban contexts, such as those investigating incidents like flooding, adopt this framework. For instance, UPE research on Jakarta's flooding explains that the actions taken by the government, like enhancing investment (political/economy), influence urban floods (change in urban nature) (Colven, 2023). Examples are also found in Bangkok in flood management studies (Section 2.4.3).

Landscape approach: human-environmental interaction

The two frameworks, SES and UPE, are closely interconnected (Fig 2-3). They examine the interactions between humans and the environment, focusing on various aspects that include governance. Where SES has a strong association with ecology or ecological system and the management of natural resources, UPE places a significant emphasis on issues related to political power, economic factors, and social justice within urban settings.

At the same time, they share a similar focus on nature or landscape, discussing these elements in relation to human interaction- through social and cultural lenses in SES, and political power and economy in UPE. Both frameworks align in a landscape approach with a holistic and interdisciplinary view (Freeman et al., 2015, Sayer et al., 2013, Milder et al., 2014), recognising the embedded and intertwining nature of human and environmental interaction (e.g.) of landscape modification (such as Forman, 1995). This thesis acknowledges that political influence and economic considerations can significantly influence management decisions (refer to UPE), while also considering the evolving patterns within the landscape and the crucial involvement of various stakeholders (refer to SES). Therefore, neither SES nor UPE alone can directly contribute to landscape studies as through the lens of the landscape approach. The landscape approach is described in its conceptualisations in design and planning (Section 2.2.1/2.2.2), the study of governance (Section 2.4), the conceptualisation of collaboration (Section 2.5.1), and framing components of this research methodology (Section 3.2.1 Chapter 3).

2.4 Landscape governance in a changing water-relate landscape

For the purposes of this research, the study of landscape governance aims to understand the complex connections between human-modified landscapes and natural elements within the sphere of institutional elements. It is essential to acknowledge that landscapes are not static (Stenseke et al., 2012) and cannot be easily managed by a single entity or traditional government structure with distinct roles and responsibilities, which are dictated independently (Reed, 2008) (see Section 2.5.1).

Governance encompasses the interactions between government, local authorities, and various actors in civil society, including the private sector, community, as well as non-governmental sectors (Smith et al., 2014). Governance sufficiency means having the capability to manage operations efficiently, make decisions, and implement policies while ensuring

stability, accountability, and effectiveness. This includes the ability to create and enforce regulations, distribute resources, cater to the needs of stakeholders, operate transparently with integrity and ethical standards, and build trust and confidence among constituents (Sevilla, 2012, Punyaratabandhu, 1985).

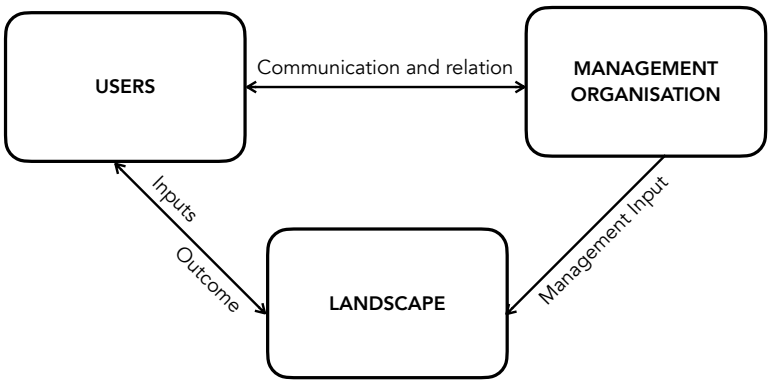


Fig 2-4: Users-management organisation-landscape: adapted from (Jansson et al., 2019)

Landscape governance pertains to the process of decision-making and the frameworks, policies, and mechanisms utilised to make decisions regarding this complex landscape (Görg, 2007, Jansson et al., 2019). The study of landscape governance encompasses institutional aspects, including the regulations governing landscape functions, spanning various policy sectors, and both formal and informal institutional arrangements. These arrangements include interactions between policymakers and stakeholders, as well as policies and functional landscapes that influenced different sectors and scales (Oosten et al., 2018, Oosten et al., 2021). At this point, three main components- users, management organisations, and landscape- are essential to investigated (Jansson et al., 2019) (Fig 2-4) and are comprised in this thesis (Section 3.2.1 Chapter 3).

Concerning management organisation, the role of leaders is described as an important factor supporting effective governance. Leaders have the potential to tackle more complex problems rather than routine issues (Sweeting, 2002) and are effective in fostering partnership (Section 2.4.3) (Slater et al., 2007). Four leadership types are classified based on their level of responsiveness and directionality, as well as whether leaders wield power over or power to others. Firstly, leaders as *caretakers* lack the ability to manage complex coalitions in local governance and often resort to rigid management strategies (1). Leaders as *city bosses* struggle to foster local governing capacity and may use overly forceful tactics when a more nuanced approach is needed (2). Leaders as *consensual facilitators*, on the other hand, effectively engage with diverse local interests and help build capacity to address local issues (3). *Visionary* leaders are the most powerful type, forming broad alliances and taking decisive action when necessary (4) (John and Cole, 1999).

At the same time, the web of systems and diverse actors across stakeholders (users and management organisations) represents one of the organisational levels that affect changes in the landscape, as discussed in the study elements of landscape change: temporal, spatial, and institutional. This institutional scale plays a crucial role in landscape change, determining who

influences the changes (Bürgi et al., 2004). It includes individuals and groups of actors, ranging from users who interact with landscapes to decision-makers who determine changes in the landscape. This institutional scale will be explored in the context of BUW and will shape the direction of the methodology (Section 3.2.1/3.4.2 Chapter 3).

2.4.1 The role of management in (unintended) changing landscapes

This section discusses the influence of management on changes in the landscape and explores how management actions influence the complexities of transformations within the urban setting as described in Section 2.3.2.

Understanding these influencers of management is essential for identifying patterns of landscape change, which is a prerequisite for detecting potential precursors of alterations. Bürgi et al. (2004) introduce the concepts of intrinsic and extrinsic factors, differentiating between influences at the community level and those shaping specific areas at the municipal level. As a result, unintended or unplanned changes, compared to intentional ones, have had a more significant negative impact on the environment in recent times (Bürgi et al., 2004).

For instance, changes in land fragmentation due to urbanisation often disrupt the integrity of stream networks, as discussed in Section 2.3.2 (Forman, 1995, Bürgi et al., 2004). This phenomenon can be explained by the *unplanned planning* of the landscape, which subsequently influences other unintended changes. For instance, Martine (2011) highlights the role of governance in shaping urban flood impact circumstances, noting that unplanned urban growth often leads to the occupation of floodplains within cities. This issue arises as a consequence of inadequate government responses to the demands for land and housing, which have recently become a significant issue in many developing countries, including Jakarta, Ho Chi Min City, and Bangkok.

The process of urban expansion often results in a failure to align land use with natural topography (Section 2.3.2), frequently due to the inability to adhere to established land-use plans. Despite the aim of land use planning to regulate urban development, these plans often fail to provide adequate guidance. For example, they may not effectively control the construction of new development projects in floodplain areas within urban environments. This issue is exacerbated by the simultaneous encouragement of economic investment, particularly evident in Asian megacities like Bangkok. In many developing countries, it is common to encounter multiple layers of "master plans" that become outdated before they can be fully implemented (Laquian, 2011).

Furthermore, the presence of vulnerable and insufficient public services in impoverished regions- including those adjacent to water areas (Section 2.2.2)- also underscores the role of government in shaping such conditions. The significant and valuable contributions of the impoverished population to the city’s economic well-being are frequently disregarded, with policymakers viewing them primarily as sources of problems (Innes and Booher, 1999). Governments often contribute to this situation by neglecting to deliver services in areas where land rights are unclear (Martine, 2011).

Management decisions over time influence how landscapes change, with actions often repeating and building upon previous ones, leading to what is known as “path dependency”, where actions taken in the past shape future decisions, resulting in the continuation of certain methods or approaches. For instance, in Oderbrunch, dykes and drainage measures introduced in 1747 to protect against flooding persisted for 250 years, withstanding severe flood incidents in 1997 and 2010 (Rohring and Gailing, 2012). This path dependency illustrates how the temporal scale of management action influences landscape change, while this thesis will further investigate the change of management practices concerning waterways in Bangkok overtime.

The above examples of management influencing landscape change are commonly linked to inadequate administration, resource constraints, and the fragmentation of local governance (Martine, 2011, Laquian, 2011). Moreover, these issues are fundamentally rooted in the complex interactions among various actors, including those from the public, private, and civil society sectors, operating across economic, social, and cultural domains (Smith et al., 2014). These interactions occur through diverse mechanisms, such as political, market-driven, and voluntary processes, and span different timeframes, from the short to the long term (Jansson et al., 2019).

These challenges arise from the inability of traditional government structures, i.e., traditional institutional structure, to effectively address the intricate problems. Urban issues, such as urban flooding and insufficient public services in particular areas, are interconnected and often overlap in both impact and scope, making it difficult for public sector agencies to manage them with their separate and overlapping responsibilities (Divay and Wolfe, 2002).

2.4.2 Bangkok governance and political economy

National and local governance: Bangkok Metropolitan Administration (BMA)

Punyaratabandhu (1985) highlights inflexibility in Thai governance structures due to centralised decision-making. The Cabinet's lack of technical expertise, the absence of real debate, the presumption of consensus, and the lack of grassroots participation reflect a political culture that is entrenched in Thai norms. Power remains concentrated, mirroring traditional monarchic structures. Punyaratabandhu's study reveals BMA’s insufficient capacity to address environmental crises, exemplified by the 1980 flooding incident where the Prime Minister assumed control, sidelining the BMA. The study notes the lack of authorities overseeing policy in Bangkok, with state enterprises operating independently. For instance, the National Housing Authority (NHA), which primarily or exclusively operates within the Bangkok Metropolitan area, is not accountable to the BMA (Punyaratabandhu, 1985).

Sevilla (2012) addresses the incomplete implementation of the Decentralisation Act (1997), which has created urban units with limited powers. Despite this, in the BMA, the distribution of staff across its 50 districts, operational responsibilities, procedures, staff policies, and resource allocation remain strongly centralised. The BMA’s limited powers mean it can only manage a fraction of the required refuse collection, parks, and recreation services. Other public facilities and infrastructure investments are handled by state enterprises. Additionally,

land use plans in Bangkok are poorly coordinated, often not aligning with provincial borders, and the BMA has limited influence in shaping the urban pattern (Sevilla, 2012).

Webster and Maneepong (2009) explore the misalignment between Bangkok and national governance. They point to political favouritism, which affects decisions made at the national level and influences the relationship between Bangkok and other provinces. Additionally, following the Decentralisation Act, budget allocations are prioritised for all local authorities over the BMA, based on the rationale that the BMA already possesses more extensive powers than other local governments (Webster and Maneepong, 2009).

Political economy and the changing landscape in Bangkok

Political and economic forces have significantly influenced changes in the urban landscape of Thailand and Bangkok. To illustrate, the privatisation movement of 1985 and the sixth national plan of the National Economic and Social Development Board (NESDB) led to economic booms, resulting in unplanned and ineffective land use control in Bangkok and disruptions in the flow of people and goods (Sevilla, 2012). The construction of arterial roads, ring roads, and expressways by the government to improve city infrastructure (1950s-1980s onward) have been closely followed by private sector-driven housing development. This expansion has pushed the city's boundaries, Bangkok Metropolitan Region (BMR), outward to the suburbs with little consideration for land use and urban development complexities. Urban planning agencies responsible for controlling land use have lacked authority over the infrastructure development due to economic favouritism. This has led to the proliferation of subdivision projects in greenspace areas (Ratanawaraha, 2013) and challenges in enforcing private land ownership, particularity with large real estate developers (Sevilla, 2012).

Marks' study (2015) addresses the context of BMR, the so-called regional planning, which has been influenced by industrialisation boundaries. The study explains the ongoing uncontrolled urban expansion of the BMR due to the influence of Provincial Administration (PA) or local political elites, who are also local businessmen. These individuals can allocate state funding for local infrastructural projects. As a result, their uncontrolled investment, driven by their own economic benefit (but not underpinned by policies), influence the uncontrolled expansion of the city (Marks, 2015). The embedded power of PA, who are political tycoons, also stems from the incomplete decentralisation structure (Marks, 2016).

There have been infrastructure projects undertaken throughout the upper and lower Chao Phraya Delta in central Thailand after 2011 flooding which can be explained by the influence of political action aimed at securing votes. The construction of dykes along the river has transformed the natural landscape in uncertain ways (Marks and Lebel, 2016). Similarly, inaction on improving the drainage capacity of encroached canals, intend to gain votes from communities, and the allocation of floodwalls based on political favouritism, have exacerbated the flood disaster. These actions have neglected the real issues of flooding and long-term environmental concern, leading to extensive change in the natural landscape (Marks, 2016).

In the Thai context, class issues and the monarchy's influence have contributed to political and social inequality. The significance of this hierarchy became evident during the 2011 flood

(discuss in Section 2.4.3) when rural communities suffered as the government prioritised protecting areas with higher economic value and high-class to middle-class neighbourhoods. Low-income communities protested by attempting to destroy flood walls built by the government, echoing the 2010 political protests (red-shirt movement) that highlighted tensions between grassroots groups and the elite. This situation underscored extreme inequality and weak democracy in Thailand (Marks et al., 2020). Marks et al. (2020), emphasised that the social vulnerability and inequality exposed by the 2011 flood were deeply rooted in Thailand's longstanding class issues.

These studies provide detailed insights into how Thailand's political economy has shaped environmental changes through urbanisation and flood disasters. They offer a significant foundation for understanding the complexities of governance and change in a city. This thesis further explores the landscape elements of BUW in this context.

2.4.3 Flood management in Bangkok

Narkpitaks (2016) addressed effective water management in Thailand in 1980, 1983, 1994, and 1997-1999. For example, it highlighted the establishment of the Flood Fighting Committee in 1983. The study emphasised the factors that led to this success, including a unified command structure, the absence of political influence, clearly defined objectives and timelines, and efficient communication channels (Narkpitaks, 2016).

However, numerous studies investigating the 2011 floods in Thailand have highlighted instances of mismanagement, emphasising that decision-making significantly influenced the landscape transformation during this flood event. These studies conclude that the 2011 flood was worsened by deficiencies in regulations and institutions governing water management and land use practices.

Jular (2017) describes the response to the 2011 flooding catastrophe in BMA. The study highlights the limitations of structural measures such as dams and dykes and the lack of flexible mitigation options, leading to public misconceptions about urban water risks. Despite efforts by the Drainage and Sewerage Department (DSD) to implement flood control measures like the Monkey Cheeks concept, i.e., retention areas, and existing drainage systems, the dense urban environment proved vulnerable to major floods exacerbated by climate change. The study addresses the inadequate implementation of the Decentralisation Act that has led to coordination issues between upstream and downstream authorities. Additionally, the heavy reliance on political influence, such as the centralisation of the elected governor and the traditional structure of the BMA where jobs are separated, affects how decisions were made in 2011. Decisions to redirect floodwater after dyke breaches faced strong resistance from local residents, despite defensive measures like sandbags being deployed, highlighting the complexities of urban flood management (Jular, 2017).

Aruninta (2020) indicates that the impact of flooding in the Chao Phraya Delta region results from poor decision-making in urban development policies, such as the ongoing investments in infrastructure along the river, upstream to downstream, before and after the 2011 flooding (Aruninta et al., 2020).

Ratanawaraha (2016) makes a significant contribution to the field of institutional analysis concerning land use plans and water management in Thailand, revealing that water and flood management are inadequately addressed in land use plans. The study pinpoints existing challenges, including the absence of a comprehensive policy framework at the regional level, limitations in controlling land use density, and issues related to the coordination and institutional capacity of local governments. At the local level, responsibility typically falls to *civil engineers*, who tend to favour structural solutions, and often lack long-term considerations. Furthermore, the study reveals that administrative boundaries frequently do not align with the hydrological and topological characteristics of regions. The 25 river basin committees (2002) do not effectively address the complex challenge of integrating land use and water management, as this is not their primary focus (Ratanawaraha, 2016b).

Studies examining the 2011 floods in Bangkok utilise the Political Ecology and UPE frameworks (Section 2.3.4). For example, Marks (2015) argues that the 2011 floods were not solely due to climate change and nature alone, as the government claimed, but rather resulted from a combination of changes in land use, over-pumping of groundwater, and poor infrastructure maintenance (Marks, 2015). Elsewhere, Marks (2016) illustrates the flaws in the Thai government's plans and suggests that political decisions significantly influenced the nature of the 2011 floods. Issues such as unregulated land use stemming from ineffective decentralisation measures (Marks and Lebel, 2016) and lack of coordination of water management sectors are critiqued (Marks, 2016). The government's decision to prioritise the protection of the inner zone of Bangkok by adopting floodwalls and elevated roadways (Fig 2-5) (Marks, 2016), or sandbag walls resulted in severe flooding in 2011 (Marks et al., 2020). This trajectory of Bangkok's governance to flood management has influenced social inequality and injustice related to climate change (Marks, 2020).

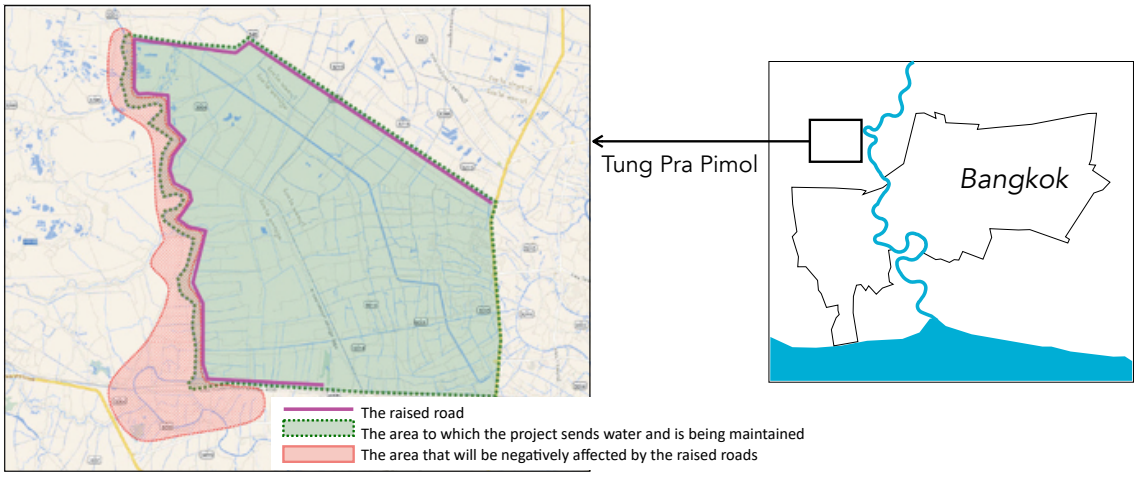


Fig 2-5 Map of raised road in Thung Pra Pimol (Marks, 2016 Page 14)

Phanthuwongpakdee's doctoral research (2016) investigates flooding in Bangkok and rural communities in Central Thailand. His work uses a Political Ecology and pragmatism lens to examine the complexity of flood hazards and adaptive strategies in Thailand. The study

indicates that while the government often relies on technological solutions and wealth-generating policies, residents consider a broader range of adaptation options, incorporating sociocultural factors. The study suggests promoting risk awareness, traditional local knowledge (Section 2.5.3), and religious practices, and strengthening local government involvement through public engagement.

These examples enrich the understanding of flood management complexities and demonstrate that the misalignment of structural measures, stemming from governmental decision-making, raises concerns about inequality. These literatures call for a deeper investigation into the decision-making process, the utilisation of knowledge, and the rationale behind their management decisions concerning landscape management of BUW.

2.4.4 Conservation management in the Old Town Bangkok

Decisions made by policymakers, which influence landscape change, are predominantly observed in "The Old Town Bangkok" through conservation policies. These policies specifically define the boundaries of the conservation zone (Fig 4-7 Section 4.3) within areas that have experienced changes over time, including the decline in cultural heritage.

Landscape changes in heritage urban areas influenced by management actions are evident globally. For instance, the ancient water towns in China such as Tongli (Porfyriou, 2019), Zhouzhuang, and Wuzhen (Liu and Shu, 2020) have seen their heritage areas decline due to an influx of tourists driven by policy directions that neglect local interests. Similarly, the Canal Belt in the Netherlands faces disruptions to locals' lifestyles due to policies supporting tourist attractions (Pinkster and Boterman, 2017, Daisi, 2012). In Venice and its Lagoon, the management of the heritage zone is complicated by delayed projects and execution uncertainties due to multi-stakeholder involvement (Munaretto et al., 2012). The water village Kampong Ayer in Brunei has experienced a decline in traditional lifestyles (Azman et al., 2021) due to Western planning approaches (Jones, 1997) and inadequate government conservation efforts (Hassan and Yong, 2019). These challenges parallel those faced in managing Bangkok's Old Town.

A study by Askew (1993) on the heritage area inside the Old Town in Banglampoo District (Askew, 1993) exhibits that conservation policy has increased the value of specific conservation elements or '*Moradok'* in Thais, despite the decline of the local identity of neighbourhoods or *'Yarn'* in Thais (Askew, 2002, Askew, 1996). The study illustrates the challenge of policy directions that consider only the royal and elite lineages. Meanwhile, Sirisrisak's studies review the decline of cultural rights due to conservation policies and call for increased participation to address social vulnerability issues (Sirisrisak, 2009, Sirisrisak and Akagawa, 2012). For example, the Pom Mahakan Fort community, located along the canal, faced challenges of relocation and turning into a green park due to conservation policies aimed at promoting tourist attractions and orderliness (Aruninta, 2009) (Section 4.3 Chapter 4). The recommendation to shift the Mahakarn Community's approach is presented through social movement, such as the Banglampoo civil action group's effort to protect the heritage printing house, *Kurusapa* (Prakitnonthakan, 2012).

Issarathumnoon (2016) reveals that there is a lack of implementation in conservation policies in Old Town Bangkok, highlighting issues such as duplication of efforts among agencies, lack of collaboration, and insufficient incentive plans for residents (Issarathumnoon, 2006). Elsewhere, her study (2020) underscores the need to adopt the Heritage Urban Landscape from UNESCO's recommendations (Section 2.2.1) for the conservation policy in Old Town Bangkok (Issarathumnoon, 2020).

Tantinipankul (2012) addresses preservation efforts in Khlong Bangkok Noi and Bangkok Yai, noting the significance of the emergence of local and professional advocacy groups dedicated to historic preservation. The study explores the dynamics of conservation agencies and their subjective directions, addressing that the local communities encounter difficulties when engaging with numerous national and local agencies to address their issues. Despite these challenges, the study cites the potential of a partnership model involving various agencies, though it acknowledges the difficulties in achieving long-term (Tantinipankul, 2012).

These studies focus on the conservation boundary of Old Town Bangkok, yet the dimension of landscape elements concerning BUW as a comprehensive network has not been examined through the lens of heritage management. This thesis will further explore the role of BUW in conservation policy. The recurring challenges related to conservation policies have been consistently addressed, prompting inquiries into why academic recommendations have yet been integrated into planning. Flood-related concerns have also been disregarded, given that the Old Town is primarily designated as protected zones. Further investigation is warranted to understand to what extent the ongoing conservation management aligns with flood prevention strategies in Bangkok.

2.4.5 Management action and values in landscape

Building on the discussion in Section 2.2.3, which elucidates 'landscape value' i.e., historical and contemporary benefits/functions of landscapes for humans, this section delves into management actions concerning landscape value and examines how management decisions shape changes in these values.

Decisions made by decision-makers directly and indirectly affect value, as attempts to manage and curb urban sprawl have often proven ineffective, particularly in developing nations. This has resulted in the erosion of landscape values, as people no longer perceive the environment's worth due to significant alterations in the landscape (Misiune and Depellegrin, 2022). Changes in the physical landscape, driven by management actions, have contributed to a decline in the value historically attributed to these landscapes (Plieninger and Bieling, 2012). Consequently, society has shifted away from the once-prevailing notion of harmonious coexistence between humans and nature (Zube, 1987).



Fig 2-6 Hindu temple with high wall which historically was on the riverbank (Left), and locked gates (Right) indicate the inaccessibility of Sabarmati Riverfront (Dempsey et al., 2020)

An example is Dempsey et al.'s research (2017) on rivers in India. Their findings show that decisions made by authorities, whether official or informal, have restricted public access to the rivers (Fig 2-6 Right). In Madurai, activities like sand mining have degraded landscape quality and led to antisocial behaviour. The rivers have lost cultural significance due to development and poor management, along with poor water quality and discouragement of their use. In Ahmedabad, the Sabarmati Riverfront project has led to social exclusion due to time restrictions, entrance fees, and community displacement. Ironically, riverfront protection action have sought to exclude inclusivity by imposing modern riverfront construction along the river (Dempsey et al., 2017). Their later research (2020) delves deeper into the riverfront context, discovering instances where cultural ties with the rivers are entirely severed, as evidenced by design decisions. This is exemplified by the Hindu temple (Fig 2-6 Left), which lost all direct physical and visual access to the river (Dempsey et al., 2020). This evidence clearly shows that the actions decision-makers instigate can have little consideration for existing cultural landscapes (Section 2.2.2).

In examining the landscape value of Bangkok's waterways, few studies have explored. For instance, research on traditional riverside communities in the Chao Phraya Delta examines cultural landscape through how neighbourhoods have benefited from floodplain landscapes and adjacent waterway areas (Yodsurang and Yasufumi, 2015, Yodsurang et al., 2015). However, this exploration is limited to specific areas and does not sufficiently address urban settings in Bangkok or management actions.

Existing literature regarding landscape value in Bangkok predominantly focuses on the value attributed to historical moats and the Chao Phraya River, particularly within heritage preservation and conservation practices in designated areas like the Old Town Bangkok (Section 2.3.4). While there is extensive recognition of their value as heritage assets within the conservation zone, outside this zone, the waterways lack acknowledgement and understanding as cultural landscapes or cultural heritage. This raises the question: Should areas actively used and inhabited by local communities be acknowledged as cultural landscapes? What is the process or manner of the decline in the landscape value of BUW? Further research is needed to investigate how value is perceived and influenced by stakeholders in the context of urban waterways in Bangkok.

2.5 Obstacles to collaboration and participation

2.5.1 Conceptualisation of collaboration

Collin and Ison (2009) use a jigsaw metaphor to indicate that climate change adaptation situations are often seen as fixed problems. When everyone looks at these situations, they see them differently and want different things, and people see their own pieces but not the whole picture. It is essential to recognise that the traditional governance structure for engaging individuals and determining authority is often inadequate when applied to issues related to climate change (Section 2.3). This is because certain circumstances may conform to traditional methodologies while others necessitate innovative strategies and approaches. The conventional method's inefficiency arises from its inherent simplicity, offering a single perspective on individuals' roles and failing to effectively address complex challenges (Collins and Ison, 2009), including managing the landscape element of waterways and water management, especially in the complex urban setting (Section 2.3.2/ 2.4.1)

Within environmental management, the concept of **common ground** is introduced, considering the terms 'shared value' and 'agreement'. Common ground refers to the shared and relevant aspects that underlie a spectrum of issues voiced by individuals. When addressing environmental management challenges, there is a possibility of drawing misleading conclusions when the primary focus is on the differences among stakeholders. On the contrary, the identification of common ground among various issues should reveal synergies rather than considering them separately. Therefore, a collaborative framework that prioritises issues of paramount significance with substantial common ground can enhance prospects for future cooperation (Lecuyera et al., 2018).

Thus far, the significance of common ground among the landscape conceptualisations (Section 2.2) has been presented as a critical means of restoring and enhancing the value attributed to landscapes while simultaneously pursuing goals of sustainability and resilience in cities. Therefore, one main question that needs to be addressed is: 'What changes are acceptable, and to what extent, such that landscape and their values can be maintained?' (Plieninger and Bieling, 2012). In pursuit of shared value and agreement or common ground, their consensus on landscape conceptualisations (Section 2.2) aligns with the goal of enhancing multi-stakeholder communication and advocating for participatory improvements (Milder et al., 2014, Sayer et al., 2013).

For example, Forman (1995) delves into strategies for creating sustainable environments through landscape planning and management in his book. He introduces the 'chairs-around-the-table' concept, underscoring the importance of convening experts from diverse fields and disciplines to foster effective communication and collaboration on shared subjects. Kendle and Forbes (1997) also examine the role of urban policies and planning in necessitating integrated, long-term strategies that consider ecological principles and social factors. Their work emphasises community engagement as a means to enhance the success and sustainability of urban nature conservation efforts.

The term **'adaptability'** (Section 2.2.2) is revisited here, this time considering this term as used in the system of management. Folke et al. (2010) introduce adaptability as 'the capacity of

actors in a system to influence resilience'. The study presents the interrelation among resilience, adaptability, and transformability. Socially, it includes the capacity to learn, innovate, and adjust behaviours or management practices. It refers to a flexible and responsive approach to managing and utilising land resources in response to changing conditions and needs. It is the capacity of the people or groups in a system to make choices that help the system remain resilient. For example, if a city faces new challenges like severe floods due to climate change, being adaptable means the city can take action to deal with these challenges and keep functioning well (Folke et al., 2010).

The term **co-management** signifies a crucial approach for governing complex resources like watersheds, recognising the need for collaboration among diverse stakeholders rather than relying solely on a single agency. It promotes partnerships involving the public, private sector, and civil society as alternatives to traditional top-down management (Berkes, 2009). **A partnership** is grounded on the premise that organisations are willing to pool their resources to accomplish objectives that they would not be able to attain individually, for example, the partnership of waste and recycling sectors in London (Slater et al., 2007). This involves joint authority and shared responsibilities between government entities and local resource users, fostering collaborative partnerships. This approach is increasingly integrated with learning-centred methods, which addresses uncertainty and complexity through experiential learning rather than rigid regulations (Berkes, 2009).

As a result, co-management and adaptive management have converged toward a common ground known as **adaptive co-management.** This concept emphasises collaboration among various stakeholders and seeks to promote flexibility and adaptation through continuous learning and improvement (Armitage et al., 2008). On the contrary, reductionism and disciplinary isolation or yield-oriented and command-and-control governance restrict the understanding of a world characterised by surprises and discontinuities (Folke et al., 2005). This adaptive management involves elements like experimentation, monitoring, and evaluation through learning by doing, collaboration across different scales, equitable distribution of power among actors, building social capacity, and integrating diverse knowledge systems (Selman, 2012).

The above conceptualisations share the potential for **collaborative dialogue and multi-stakeholders approaches** as governance strategies, which are considered necessary to pursue in order to address any of the landscape conceptualisations (Section 2.2). For example, academics call for a multi-stakeholder approach to implement the concepts of NBS (Frantzeskaki et al., 2023). Gaining shared consensus also involves integrating collaborative planning (Healey, 2006), transforming bureaucratic norms, and fostering governmental flexibility. Collaboration addresses the idea that public agencies must shift from control-focused approaches to those emphasising societal welfare improvement, with a focus on performance metrics and adaptable management. Similarly, the public and elected officials must transition from standards-based evaluation to rewarding innovation, experimentation, and shared intelligence (Innes and Booher, 2003).

The term **'landscape approach'** is revisited here as a means to establish a framework that facilitates the integration of policy and practice for managing multiple, often competing, land uses by implementing collaborative dialogue and multi-stakeholder approaches (Milder et al.,

2014, Sayer et al., 2013). Since concentrating efforts on a single issue can lead to simultaneous adverse social and environmental consequences, the comprehensive framework of the landscape approach is recommended (Oosten et al., 2018). This term is formulated through an interconnected and integrated approach, primarily because different stakeholder groups may have differing views on the relative importance of social and environmental challenges (Reed et al., 2016).

Institutional study of collaboration in flooding management in Bangkok

In Thailand's context, there are institutional studies investigating flood management which share the same recommendation for collaboration. For example, Saito (2014) identifies that while flood management measures are in place, they do not explicitly address climate change, and there is a lack of coordination among departments in the BMA. The current focus on structural solutions needs to be complemented with non-structural options. Achieving this requires a transformative change in institutional arrangements (Fig 2-7) (Saito, 2014).

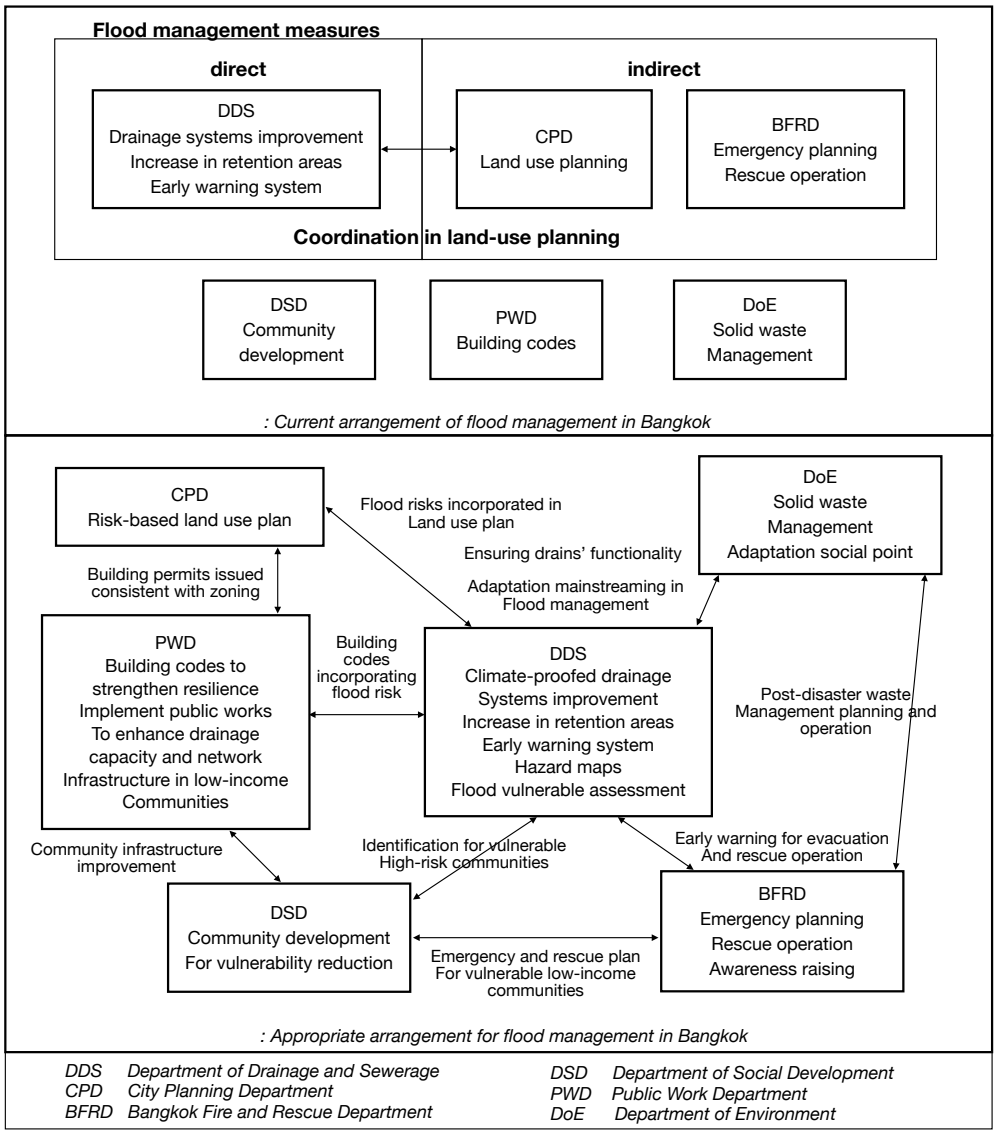


Fig 2-7 Flood management in Bangkok- current structure (Above), suggesting structure (Below) (Saito, 2014 Page 98)

Nair et al. (2014) recommends policy directions aimed at ensuring Bangkok's future in the face of changing uncertainties at different levels. These challenges predominantly arise from the conventional approach of assigning a single agency to manage flood risk (Lebel and Lebel, 2018). Meanwhile, Jular (2017) comments on the 2011 flooding management, describing how various committees, created under different governments, relied on executive power, and incoordination problems between upstream and downstream authorities persisted (Jular, 2017).

These studies have delved into prospective scenarios and institutional facets of flood management. This opens the opportunity for further investigation into how collaboration can integrate heritage management into flood management practices, which will be explored in this thesis concerning the BUW. While existing studies have embraced a comprehensive viewpoint through critical scrutiny of (e.g. strategy) documents, they underscore the necessity for further research incorporating empirical data, particularly from the local communities.

2.5.2 Knowledge and value in decision-making

Knowledge integration has become a central subject in adaptive co-management fields (Berkes, 2009), which address and promote interdisciplinary and multi-stakeholder approaches (Milder et al., 2014). The importance of considering different types and sources of knowledge to effectively address the intricacy and uncertainty inherent in global environmental challenges is needed. It emphasises the need to integrate knowledge held by academics and non-academic participants, build on different knowledge (Table 2-1) to address research or applied questions (Collins, 2014). Knowledge integration employs participatory research techniques, follows iterative processes involving the creation, application, reflection, learning, and feedback on scientific findings or decision-making, and incorporates knowledge spanning diverse spatial and temporal scales (Raymond et al., 2010, Collins, 2014). The definition of knowledge is summarised in Table 2-1 in the realm of environmental management literature (Raymond et al., 2010).

The importance of collaboration (Section 2.5.1) has a strong connection to the role of knowledge integration, which is aided by bridging organisations and acts as platforms for knowledge creation (Choo, 2002), co-producing knowledge, fostering trust, facilitating sense-making, and promoting both vertical and horizontal cooperation (Berkes, 2009). The crucial significance of bridging organisations lies in bridging diverse knowledge systems and cultivating social capital (McGonigle et al., 2020). Importantly, managing complex ecosystem services and human well-being effectively necessitates extensive knowledge that no single agency can entirely possess, underscoring the need for collaborative approaches (Berkes et al., 2000, Berkes, 2009), especially from the tacit knowledge gained through collaborative learning (Gray et al., 2012).

Knowledge class	Generated through	Type of knowledge	Definition
	Traditional cultural rules and norms	Indigenous	Local knowledge held by indigenous peoples, or local knowledge unique to a given culture or society
		Traditional Ecological Knowledge	A subset of indigenous knowledge involves information and beliefs transmitted across generations through cultural means, focusing on the interactions between humans and the environment.
	More recent human-environmental interaction	Local ecological	A community's knowledge about nearby ecosystems and the interactions between organisms and the environment is influenced by recent human-environment interactions over a few generations rather than deep-rooted cultural practices.
	Personal experience	Personal	The broad spectrum of information individuals hold about something encompasses tacit, implicit, expert, or non-expert knowledge gained through diverse experiential processes.
(1)		Lay	Typically denotes non-expert, localised, or informal knowledge representing people's everyday interpretation of a situation, as opposed to expert knowledge or formalised processes.
Experiential/ local knowledge		Local or situated	Understanding specific phenomena indicates expertise in local issues, such as the insights of land managers or ecological details like species habitats. It is distinguished from the expertise of external professionals who may overlook local nuances.
		Tacit	Hidden, abstract unconscious knowledge that significantly influences thinking and behaviour is challenging to articulate, like recognising faces without being able to explain how. This knowledge is deeply tied to worldview, values, personal experience, and expertise.
		Implicit	Knowledge an individual is aware of but hasn't yet articulated for others, whether orally or in written form. Different from tacit knowledge, as it can be expressed.
		Informal	Emphasis on the lack of structured processes to regulate how these experiences impact understanding.
		Non-expert, Novices	Knowledge that lacks the depth of experience and characteristics demonstrated by experts.
		Expert	Reflects extensive experience, whether formal or not, often gained through years of practice. This knowledge, often tacit, allows experts to recognise patterns and address issues not readily apparent to novices. Experts can adapt flexibly to new circumstances. This expertise is distinct from scientific knowledge.
(2)	Formalised processes		Emphasising agreed-upon principles relies on varied definitions of 'evidence' shaped by philosophical perspectives and knowledge-determination methods.
Scientific knowledge		Explicit	Knowledge in written, codified, and categorical form that is widely accessible.
		Formal	Subjected to a universally accepted set of rules to qualify for a specific use.
(3)	A social learning		Knowledge types that have, in some way, been integrated. Multi-disciplinary studies involve different disciplines, with knowledge exchange after separate studies. Interdisciplinary approaches fully integrate methods from the start, creating novel knowledge. Trans-disciplinary approaches involve non-academic participants.
Hybridge knowledge			

Table 2-1 Different definitions of knowledge within the discipline of environmental management (Raymond et al., 2010)

The term **knowledge exchange** in the realm of environmental management is examined by Fazey et al.'s studies. Knowledge exchange involves the methods for creating, sharing, and applying knowledge in a manner suitable to the context, encompassing concepts like sharing, generation, co-production, co-management, and knowledge brokerage, which are significant in integrated landscape management to connect policymakers and researchers to inform policies (Fazey et al., 2014). The knowledge exchange is a vital factor in enhancing decision-making for intricate environmental issues. The models of knowledge acquisition are influenced by individual activities, such as problem-solving approaches and learning capacity. The process is nuanced and iterative, involving reflection, experiential learning, making implicit knowledge explicit, and internalising shared knowledge. This approach promotes the co-production of knowledge and adaptive learning. Following this, the study suggests the process-oriented approach to improve knowledge exchange, recognising the social determinants of decision-making (Fazey et al., 2012).

At this point, the notion of value is revisited, considering 'value' in the context of how it plays a role in shaping knowledge in decision-making process. In organisational decision-making, the rational ideal involves recognising options, forecasting outcomes, and assessing based on preferences (Bell et al., 1977). Choo (2002) addresses four decision modes that deviate from the rational ideal due to specific circumstances (Fig 2-8). The (boundedly) rational mode uses stored rules for familiar situations, economising time. The process mode involves iterative searches for new solutions in unfamiliar situations. The political mode allows alternative views, with decisions resulting from bargaining among players. The anarchic mode enables organisations to discover goals and find solutions in unfamiliar situations (Choo, 2002).

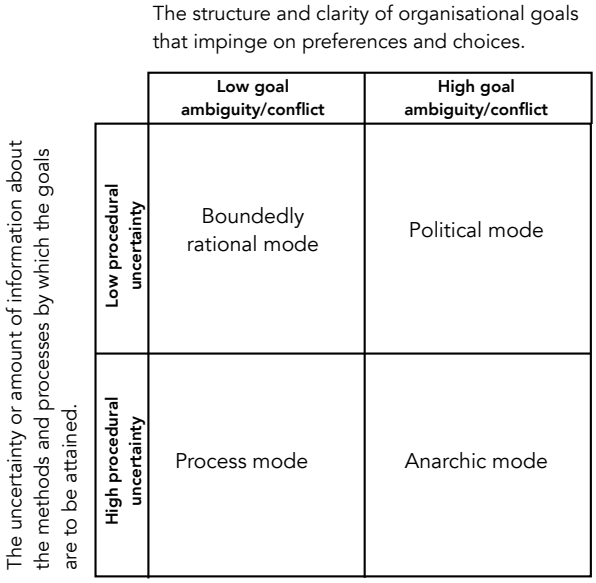


Fig 2-8 Four modes of organisational decision making (Choo, 2002 Page 84)

There is a close connection between knowledge and values: values are involved in creating knowledge, and scientific knowledge, in turn, has value-related implications, especially in decision-making processes. Scientists' decisions at every stage of research, from selecting topics to using methods and interpreting data, are influenced by values (Elliott, 2011). This influence of values is evident not only in generating knowledge but also when applying scientific knowledge to make decisions (Choo, 2002). Researchers and decision-makers rely

on certain ideas about why they think the data they produce are important for making real-world decisions (Bell et al., 1977). These ideas, which come from their values, are crucial for how each policy approach works in practice (Todt and Lujan, 2014, Lele et al., 2023).

Todt and Lujan (2014) underscore the **cognitive and noncognitive values** in decision-making. Cognitive values pertain to internal knowledge processes, such as accuracy and consistency, while noncognitive values, like environmental concerns and ethical considerations, are external to science. Their study highlights that noncognitive values should complement knowledge generation rather than restrict it, offering valuable insights. Recognising the interplay between cognitive and noncognitive values is crucial for effective decision-making (Todt and Lujan, 2014), allowing for balance and trade-offs (Bell et al., 1977, Choo, 2002).

There are two distinct roles of science in decision-making: **arbitrating and facilitating.** In the arbitrating role, decisions rely on academic science and experts, while in the facilitating role, societal preferences influence decisions, and knowledge is shaped by social contexts. These two roles highlight a fundamental conflict between innovation and protection values, where decision-makers must choose between technology-driven advancements and options safeguarding against unintended harm and environmental impact. Their study advocates for methodological learning in decision-making to overcome this conflict (Todt and Lujan, 2014).

Methodological learning in decision-making involves using tailored scientific methods that explicitly consider noncognitive values. This approach aims to improve the alignment between decision-making methods, generated knowledge, and regulatory objectives, allowing for trade-offs between accuracy and operationalisation in decision-making processes (Todt and Lujan, 2014). This also aligns with the anarchic mode of decision-making (Choo, 2002).

Lele et al. (2023) explore the value in decision-making regarding large-scale infrastructure projects like dams and mines in the Global South. The study addresses a unique challenge in societal decision-making of such projects: the central dilemma lies in the trade-offs between the instrumental or material values of nature and the values ecosystems provide. Their work highlights the significance of relational values, expressed by local communities opposing projects, emphasising cultural ties and connections with the affected environment. Communities combine experiential knowledge with modern science, proposing alternatives or modified designs, despite the influence of these alternatives on the ultimate decision remaining uncertain and often lacking resources for detailed proposals. The study calls for improved decision-making that integrates diverse values from nature and marginalised stakeholders (Lele et al., 2023).

Despite a lack of research on the amalgamation of knowledge and values in decision-making, particularly in the context of landscape management and environmental issues in Bangkok, these concepts are pivotal for this thesis. The objective is to understand how institutional structures operate based on the values they embrace, the interplay between values and knowledge, and the extent to which knowledge can be integrated among stakeholders considering the BUW. This will shape the research methodology and be discussed more in Section 3.2.1 of Chapter 3.

2.5.3 Local knowledge and participation

Studies of knowledge integration in environmental management significantly focus on the class of local knowledge (Table 2-1). The fusion of local and scientific knowledge is particularly important and represents one of the consequences of involving stakeholders in tackling environmental issues (Reed, 2008). Combining scientific and local knowledge is generally a challenging attempt. Many scientists and government officials exhibit a certain scepticism about local knowledge, especially when it is tacit or unwritten, as it can be challenging to articulate and convey (Berkes et al., 2000, Folke, 2004). Additionally, when indigenous groups are involved, local knowledge often stems from a distinct worldview compared to Western science, leading to variations in starting points, assumptions, and rules (Berkes, 2009).

The notion of considering the small scale of community in environmental management is embedded throughout the landscape conceptualisations (Section 2.2). While landscape professionals can offer valuable insights into a place's functionality, relying solely on their expertise may result in limited perspectives. The local community possesses extensive knowledge about the site's history, its integration with other spaces in the area, and its potential future uses. Involving these "users,"i.e., local community, is essential for gathering the necessary insights and ensuring that any environmental enhancements align with their requirements and efficiently achieve the intended goals (Kendle and Forbes, 1997).

The term **community-based conservation** is addressed using local knowledge as its factor, emphasising participatory management, as considering ecosystem complexity requires a participatory approach due to increased stakeholder engagement (Berkes, 2004). Berkes (2004) notes that community-based conservation is required to overcome the shortcomings of inadequate implementation, particularly concerning authority delegation and advocating the segregation of conservation and development approaches. Meanwhile, contrasting perspectives and scales between local communities and policymakers normally arise, influencing the outcomes of community-based conservation. Scale is pivotal in aligning institutions with ecosystems and representing stakeholder viewpoints. Uniform or traditional management often neglects scale-related challenges, hindering effective environmental management. Recognising and accounting for multiple scales is essential as this prevents the pursuit of a singular perspective within a complex system, necessitating simultaneous analysis across various scales. Thus, community-based conservation strives to foster participation across diverse scales, including the incorporation of local knowledge (Berkes, 2004).

Raymond (2010) highlights the crucial role of local knowledge in shaping inquiries and empowering communities in environmental decision-making, when the residents play a crucial role in shaping the choice, as seen in the Solomon Islands case (Berkes et al., 2000), when the residents were involved from the early planning process. In contrast, initiatives favouring scientific methods potentially limit stakeholder involvement. Projects of this type, which normally integrate local insights later, often experience insignificant local influence. The study addresses the need to shift in scientific practice from product-focused approaches to problem-centric processes for addressing environmental management challenges (Raymond et al., 2010).

While the global example studies focus on natural resources, and the example study from Section 2.4.3 concerning flood mitigation was in the rural communities in Central Thailand (Phanthuwongpakdee, 2016), an investigation into the urban context of Bangkok is needed. The context of BUW can apply the notion of local implication in contributing to management practices. It draws inspiration from international studies on how stakeholders' knowledge evolves when addressing waterways and how locals can potentially contribute to management practices.

Understanding participation process

The following paragraphs centre on the notion of local participation. This can be explored from the classic study of Arnstein (1969) in the U.S. context, which mainly focuses on the notion of power and its distribution among individuals, corporations, and states. The study identifies the "ladder" as a key framework through which power is conceptualised. Within this framework, participation is viewed as a categorical expression of power. Arnstein's participation ladder consists of eight rungs, illustrating the extent to which ordinary individuals can participate in decision-making processes. For the lower rungs, labelled "manipulation" and "therapy," participation is nominal, with citizens having little to no influence. When ascending the ladder and encountering "informing" and "consultation," citizens receive information and may provide feedback, but their impact on decisions still remains somewhat limited. The "placation" rung signifies tokenism, where citizens' involvement is a symbolic gesture. Genuine citizen power emerges at the higher rungs of "partnership" and "delegated power," where collaboration and shared decision-making become profound. The top rung, "citizen control," reflects the ideal state where citizens are involved to hold substantial authority and influence in shaping policies and actions (Arnstein, 1969).

This can represent a power struggle between citizens striving to ascend the ladder and the institutions that may restrict their progress towards the top. These entities act as barriers, hindering citizens from asserting control or gaining power over their circumstances. The ladder serves as a tool to gauge the degree of people's involvement in decision-making, ranging from minimal influence to substantial control (Arnstein, 1969). The degree of engagement is also underscored as a crucial element in managing stakeholders' involvement in environmental management (Reed, 2008).

Collins and Ison (2009) challenge Arnstein's concept of participation, arguing that it may hinder effective solutions when considering the realm of climate change. They propose a different approach that views climate change adaptation as a complex challenge where no single group possesses exclusive knowledge and solutions. Instead of the traditional focus on power in decision-making, Collins and Ison advocate a shift toward social learning. This means people should collaborate to better understand and address climate change's challenges. They emphasise that participation is not a straightforward path from no involvement to complete control; it is about collective learning and adapting to the evolving climate. The roles and responsibilities of those involved can change over time, depending on the specific situation. Climate change adaptation, according to them, involves a collaborative process where intelligent stakeholders develop communication skills and engage in social learning (Collins and Ison, 2009).

Study of local involvement in Bangkok

In Bangkok, many studies centre around Bangkok's institutional structure (Section 2.3.2) contributes to the need for enhancing public involvement, moving beyond the existing highly centralised efforts. This includes, for instance, advocacy for amending the BMA Act to enhance local autonomy (Punyaratabandhu, 1985).

Other studies on flooding management (Section 2.3.3) consistently reveal a lack of community participation in water governance decisions (Sajor and Onfsakul, 2007, Storey, 2012, Zevenbergen et al., 2013), complicated administrative systems with a lack of accountability from locals administrators, and limited policy incentives for locals (Thanvisitthpon et al., 2018, Sajor and Onfsakul, 2007, Nikomborirak, 2016, Poapongsakorn and Limskul, 2013). For example, the reduction of annual public hearings after 1975 from two to one in the comprehensive planning process might speed up the process but could lead to (unresolved) conflicts in land use decisions and water resource management (Ratanawaraha, 2016b).

Although there was a movement in the resilience approach through the policy pioneered by the Rockefeller Foundation, which Bangkok being one of the 100 resilience cities (BMA, 2017), the limitation of the local community and civil society involvement has still remained (Laeni et al., 2019). Researchers conclude that a community-driven approach to tackle urban resilience is needed, with a call for inclusivity to play a significant role, supported by government agencies (Laeni et al., 2019, Jular, 2017, Ratanawaraha, 2016b, Ratanawaraha, 2016a, Phanthuwongpakdee, 2016). The local planning culture, such as promoting small-scale land ownership or adopting area-based strategies, is also being studied to see if it can contribute to strengthening urban resilience (Rongwiriyaphanich, 2012, Rongwiriyaphanich, 2014, Rongwiriyaphanich, 2011).

Similarly, studies on conservation management in the Old Town Bangkok (Section 3.4) share their conclusion of needing to enhance local involvement (Aruninta, 2009, Sirisrisak and Akagawa, 2012), recognising the importance of traditional communities and residents (Tantinipankul, 2012, Issarathumnoon, 2020, Prakitnonthakan, 2012). For instance, Peerapun et al. (2020) review the Old Town Conservation Policy 2032 and call for improving public engagement and effective resident participation, as well as collaboration among agencies to pursue this plan.

While the above studies emphasise the importance of participatory approaches, there remains a lack of clear investigation into the recent processes associated with BUW projects, particularly regarding the view of landscape elements. This also raises questions about the influence of stakeholder engagement events on the government's project decisions within the Thai context. Global studies, like Arnstein's Ladder of Participation, prompt inquiries into how recent public hearing events in the Thai context influence or are relevant to policy direction. Further investigation is required to explore this relationship.

2.5.4 Obstacles to implementation

Previous research conducted in Bangkok, as reviewed above, leads to the question of why conventional methods, such as primarily relying on structural measures, persist despite recurring flooding incidents and the decline of cultural heritage. It is crucial to examine why recommendations for landscape conceptualisations, initiatives, and landscape approaches have not been implemented in Bangkok. Hence, this section explores the literature studying the rationale behind management actions and decision-making processes, aiming to understand why specific actions are taken or decisions are made.

Problem framing and messy situation in landscape management

The term **problem framing** is presented here, which is a crucial and recurring aspect of any planning process, with substantial implications for garnering stakeholder backing for planning decisions and their subsequent implementation (Talen, 1996). The element of water catchments comes with challenges due to their unique characteristics. Framing them as resource dilemmas emphasises complexity, uncertainty, interdependency, controversy, and multiple stakeholder perspectives (Dunham et al., 2018). These characteristics can make it difficult to define boundaries, understand relationships, deal with uncertainties, and manage controversies (Oosten et al., 2018, Lecuyera et al., 2018).

Stakeholders shape their roles and responsibilities based on their perspectives and values. This approach aligns with the idea of **messy situations** (Collins and Ison, 2009), including the complexity in urban areas (Laquian, 2011) (Section 2.3).

Reed et al. (2016) explore the widespread embracing of the **"win-win" rhetoric,** which is often driven more by its marketability and appeal to donors and policymakers. This has led to a reluctance to acknowledge the inevitable trade-offs that can arise when pursuing joint conservation and development goals (Reed et al., 2016, Lecuyera et al., 2018). In practice, many management and policy interventions tend to favour certain parties, creating winners and losers in the process. There are three primary reasons behind the challenge of achieving these win-win situations. Firstly, the complexity of balancing multiple objectives is often oversimplified, with a tendency to focus on one objective at the expense of others. This is also related to the challenge of 'multicausality', wherein planners try to manipulate only particular aspects of land development to assess the impact of planning decisions. Secondly, despite the call for integration, policymakers tend to remain entrenched in their disciplinary silos, hindering collaboration. Finally, the community may confuses the solutions to complex scientific questions or be guilty of 'muddying the waters' (Reed et al., 2016).

Considering the management of landscape elements like waterways in the urban setting in Bangkok, these phrases - problem framing and messy situation - characterise how intricate aspects manifest within an organisational structure. This can be used to investigate how stakeholders frame the problems to the landscape element of BUW, which is also reliant on the landscape value and knowledge as discussed earlier. The challenge of win-win situation is also explored in this thesis considering BUW.

Understanding the Implementation phase

It is important to understand the concept of the **implementation phase** carefully: while plans may appear sound during the planning stage, their implementation can be fraught with challenges, potentially resulting in incomplete or partially realised outcomes, cost overruns, and delays (Alexander and Faludi, 1989). In this context, the term *implementation* draws attention to how plans or policies that guide future urban development have been carried out (Pressman and Wildavsky, 1984). This involves examining whether the development trajectory outlined in physical plans has been followed (Talen, 1996).

Plan implementation typically encompasses a diverse group of participants, all of whom play a crucial role in ensuring successful execution. Planning primarily falls within the purview of planners, analysts, and experts, occasionally involving the management of executive agencies. Implementation also hinges on the efforts of operators, rank-and-file employees, or frontline workers, as well as professionals and service staff (Talen, 1996, Merkus et al., 2019). At this stage, these individuals often find themselves making pivotal decisions on how to translate relatively abstract plans into practical operational activities. With various stakeholders involved, conflicts and dilemmas can arise, potentially leading to outcomes that deviate from the initial plans or guidelines (Talen, 1996, Phi et al., 2015).

Policy implementation analysis delves into the intricate nature of collaborative actions resulting from the involvement of various actors in the execution of public policies. Policy implementation not only concerns the execution of activities but also explores the interplay between planning and practice, shedding light on how planning is actually put into action (Alexander and Faludi, 1989, Pressman and Wildavsky, 1984).

Challenges related to plan implementation have persistently affected fields such as flood mitigation and conservation management, which operate within a multi-stakeholder framework. The effectiveness of this process is contingent on the motivation and capabilities of the individuals participating (Talen, 1996). For instance, Phi et al. (2015) explore the implementation of flood management plans in Ho Chi Minh City and highlight challenges such as cost-benefit distribution, technical and institutional abilities, and weak institutional capacity in land acquisition and coordination, all resulting in delays (Phi et al., 2015). Similarity, Venice and its Lagoon experience delayed projects and uncertainty in execution due to multi-stakeholder involvement (Munaretto et al., 2012). The notion of investigating the implementation phase aligns with the incidents of BUW and its management, which can address the reasons behind the ongoing direction.

Logics of action and inaction

The term **logics of action and inaction** helps understand implementation. Logics of inaction refer to how policies can be created and not achieved during the implementation phase, leading to delays and dilution of policy implementation (Sharman and Perkins, 2017). Inaction, in this context, refers to persuasive arguments or frames that justify maintaining the status quo or increasing conservatism, despite the original policy's intended goals. Policy outcomes are influenced by various factors, including actors' rhetoric, institutional factors like organisational capacity and administrative fragmentation. It involves examining what

happens after the initial legislative act, including informal factors, and those factors that shape subsequent enactment (Sharman and Perkins, 2017), including examining the attitudes of stakeholders (Dobson and Dempsey, 2021).

Multiple knowledge practices are used to shape alternative realities and potentially conflicting policy outcomes, involving a series of choices that occur during decision-making (Barry, 2012). When contemplating the significance phase of decision-making in alternative stages, there is a concurrent focus on debating priorities and questioning the decision-makers' direction, which may sometimes lead it away from its intended objective (Hoppe et al., 2017).

According to Donaldson et al. (2013), flood risk management in the UK has addressed common issues of controversy and inaction in this field. The UK government's approach to flood prevention in the 20th century led to a transition from safeguarding agricultural land to prioritising urban areas. While extensive flood defences are costly, recent policies explore alternatives, including natural floodplain processes. Nevertheless, these alternatives can be controversial due to their lower visibility and the potential transfer of risks to less densely populated floodplain regions, often sparking disputes following flood events (Donaldson et al., 2013).

There is observed experience where climate change mitigation policies have fallen short of their initial goals (Reed, 2008, Fazey et al., 2012). In this intricate issue, decision-makers often dilute their commitments in practice, and individuals or groups whose interests are threatened, or those who oppose climate change action, are expected to resist these policies by employing arguments that support inaction. These arguments tend to influence climate policy decision-makers. Various factors, including differing values and priorities, contribute to the decisions made in this regard (Hoppe et al., 2017).

The term logics of (in)action plays a crucial role in shaping this thesis. This has contributed to the understanding of the global evidence base and driven this thesis towards the investigation of the action and inaction taken by the decision-makers in Bangkok regarding landscape management.

2.6 Conclusion

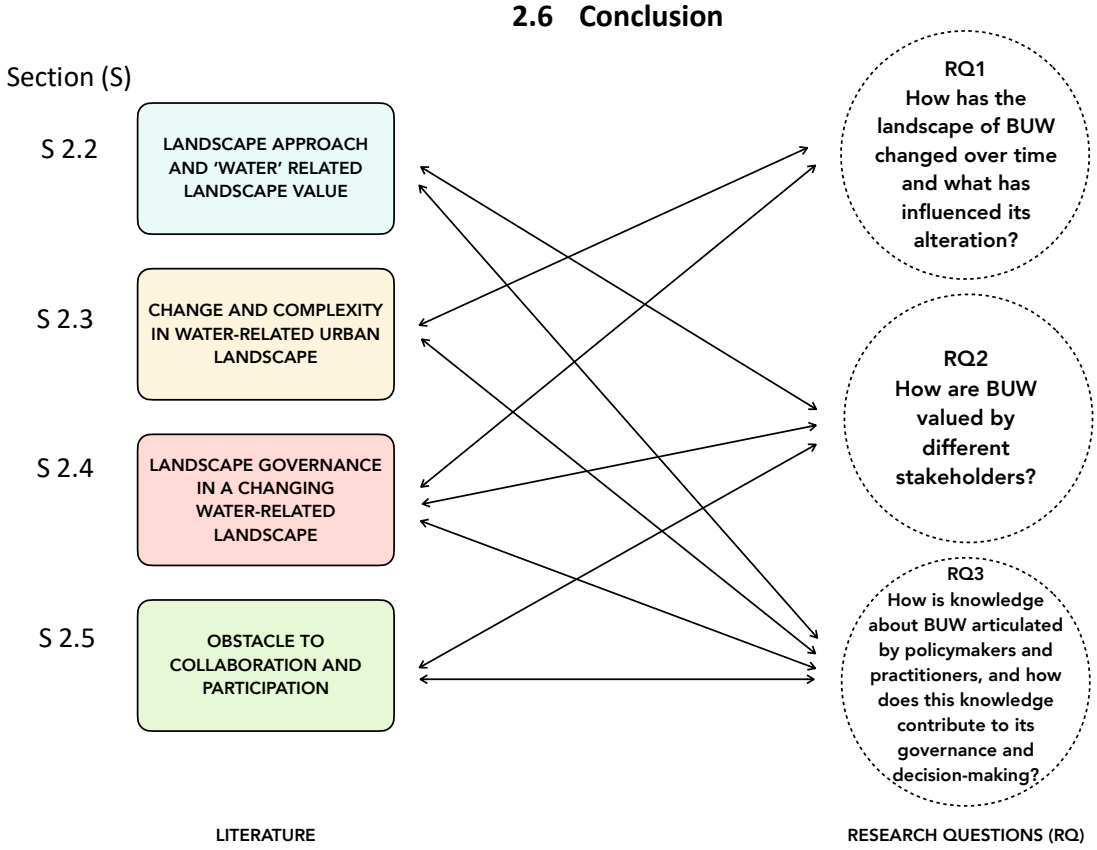


Fig 2-9 The research questions framing from the clustering of literature

An overview and studies of landscape conceptualisations covering the holistic landscape approach address the need for further investigation to explain why these recommendations have yet to be implemented. Exploring the extent to which landscape knowledge articulated in management and decision-making leads to actions requires an answer. The landscape value of BUW is also needed to be explored (S 2.2).

While existing literature grasps the complexity of changes in the landscape addressing transformation in the water-related dense urban setting, this warrants further examination of the transformation process of BUW, particularly in local community contexts, and the course of actions to address uncertainty in the urban context and climate change (S 2.3).

Further exploration is requested to understand how governance influences landscape changes in BUW, including flooding incidents and the place of heritage through BUW's role. Investigating how decision-making can lead to shifts in value and the loss of cultural heritage beyond the conservation zone is necessary (S 2.4).

Collaboration to combat managerial fragmentation needs further exploration in the BUW context, including an exploration of positions of value and knowledge in the decision-making process. BUW requires a more comprehensive examination of local knowledge and participation processes. Understanding BUW's management actions and inactions also needs to be investigated (S 2.5).

The next chapter will outline the methodological approach taken in this thesis.

Chapter 3 Methodology

3.1 Introduction

This chapter describes the general scope and scale of the methodology, beginning with a philosophical and theoretical foundation (Section 3.2) to help the reader comprehend the qualitative research approach. Section 3.3 describes the desk review in detail and the qualitative techniques rooted in this thesis. Section 3.4 defines the research design, including the case study approach and site selection process, and borrowing ethnographic principles are presented alongside the participant selection process. Section 3.5 discusses the iterative approach and the sequential data collection, the researcher's positionality and the fieldwork of interviews, site surveys, and focus groups. Sections 3.6 and 3.7 describe the thematic analysis and the creation of research materials before concluding with a statement on the ethics approval process for the research (Section 3.8) and reflecting on the fieldwork (Section 3.9).

3.2 Philosophical foundation and qualitative research

The sphere of social science, marked by diverse perspectives and dynamic societal norms (Kuhn, 1962), deals with the absence of unequivocal answers in investigating social phenomena and highlights the subjective nature of methodological choices (Blaikie, 2007). In alignment with this social science paradigm, the researcher undertakes to meticulously examine and critically assess the influence of cultural, historical, and social factors on knowledge construction in the context of landscape governance of Bangkok Urban Waterways (BUW). This approach contributes to a more nuanced understanding of the complex contexts within which the study operates. The research adopts a social science perspective grounded in the principles of social constructionism.

3.2.1 Social constructionism and research into decision-making

The constructionist approach emphasises the active role of individuals in constructing their understanding of reality (Blaikie, 2007) with a particular focus on the significance of meaning and interpretation (Ritchie et al., 2013). According to Ritchie et al. (2013), the interpretation of perspectives from different individuals holds significant sway in shaping their worldviews. Practicing this constructionist approach emphasises and values human interpretation of the social world, highlighting the significance of both participants' and investigators' interpretations and understanding of phenomena (Ritchie et al., 2013).

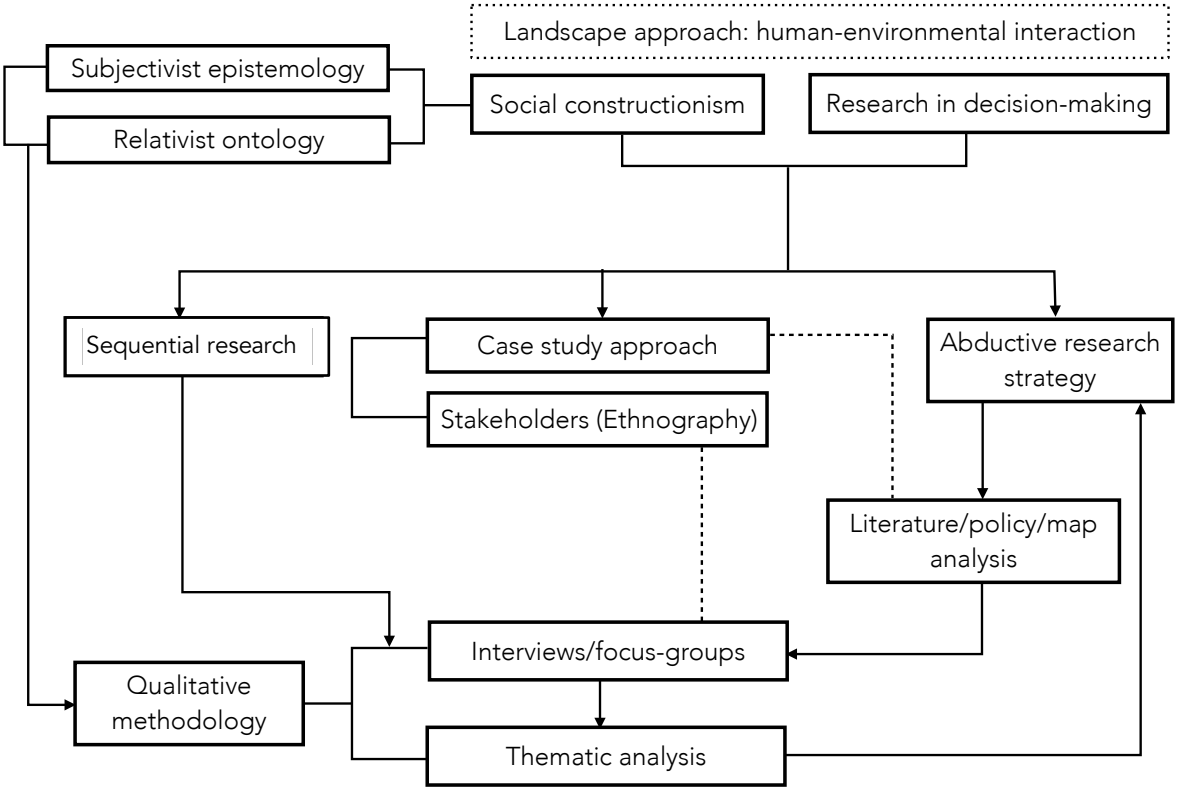


Fig 3-1 Diagram illustrating the methodology employed in the thesis

Burr (2015) describes that social constructionists specifically emphasise the social aspect of reality construction, focusing on how shared meanings, beliefs, and understandings are collectively created and maintained within a social group or society. Social constructionists often highlight the influence of cultural and societal norms in shaping perceptions and interpretations of reality (Galbin, 2014, Burr, 2015). The approach argues that reality is not objective but, in large part, a product of social agreements and interactions (Burr, 2015). Moreover, a focus on social constructionism is on exploring how events, processes, and qualities are described and represented in language. This type of analysis specifically examines how descriptions of what is considered real are created, communicated, and evolved over time (Galbin, 2014).

Such a methodological orientation is evident in this thesis (Fig 3-1), which delves into diverse stakeholder experiences through their perspectives considering the landscape of BUW. This aligns with the landscape approach to studying the interaction between humans and the environment (Section 2.3.4 Chapter 2).

The research includes three components: landscape, users, and management organisation (Jansson et al., 2019), focusing on the waterways in Bangkok, BUW communities, and management organisation involved (Fig 3-2). It aims to explore landscape governance (Görg, 2007, Jansson et al., 2019) and human-landscape interactions (see Section 2.3.4).

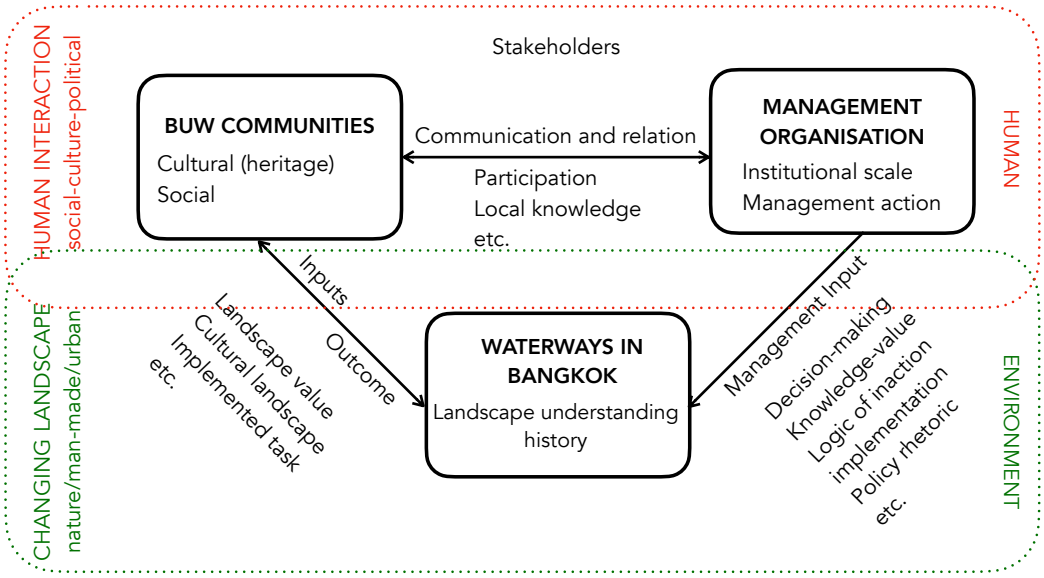


Fig 3-2 The study of BUW through landscape approach: human-environmental interaction concerning landscape governance study

The research encompasses the intricate relationship between BUW landscape and stakeholders (Section 3.4.2), as well as management action, investigating how governmental and institutional decision-making processes unfold (Oosten et al., 2018). It explores the processes, factors, and outcomes associated with how individuals, groups, or organisations make choices (Choo, 2002, Lele et al., 2023), and the underpinning reasons for these decision (Dobson and Dempsey, 2021, Sharman and Perkins, 2017). This aligns with the social constructionist approach (Fig 3-1).

To effectively capture the components in Figure 3-2, a qualitative methodology has been employed (Bell et al., 1977). This choice of methodology is grounded in its suitability for exploring evolving perspectives and values among diverse stakeholders (Gray et al., 2012). Qualitative approaches offer distinct advantages in collecting and analysing data related to the utilisation of knowledge in decision-making processes (Loschner et al., 2016). Essentially, a qualitative approach was chosen for its capacity to unravel dynamic shifts in stakeholder perceptions and comprehensively examine how knowledge shapes decision-making.

In this context, a subjectivist epistemology that emphasises the subjective experiences and perspectives of individuals is employed. This thesis recognises that knowledge is constructed by individuals based on their unique interpretations of the world. The qualitative approach is employed because it allows researchers to explore the rich and varied perspectives of individuals, acknowledging the diversity of constructed realities. Simultaneously, a relativist ontology, suggesting that reality is not a fixed, objective entity but rather a product of individual and social construction. There can be multiple, equally valid realities as different individuals or groups construct their own understandings. This aligns with an ontological stance that views reality as context-dependent, acknowledging that the meaning of a phenomenon can vary based on the context in which it is situated (Ritchie et al., 2013).

Therefore, this thesis emphasises the importance of understanding phenomena within their specific contexts. Social constructionism with subjectivist epistemology and relativist ontology forms the principles underpinning this thesis, rooted in qualitative methodology (Fig 3-1). This nuanced approach ensures a comprehensive examination of the multifaceted nature of stakeholder experiences and their influence on shaping knowledge paradigms within the research framework.

3.2.2 Abductive research strategies

Following social constructionism, this thesis employs an abductive research strategy. Its starting point is the social world inhabited by the individuals under investigation. The goal is to unveil their constructions of reality, how they conceptualise and attribute meaning to their social environment, and their unspoken knowledge. Insight into these constructions is gained by analysing the knowledge social actors employ in producing, reproducing, and interpreting the phenomenon under study. This social scientific typification offers an understanding of the activities and can serve as components in more systematic explanatory accounts. The abductive research strategy is therefore useful in addressing both 'what' and 'why' questions (Blaikie, 2007).

The researcher did not rely solely on empirical evidence to build knowledge through an inductive strategy, nor did they fully confirm or reject knowledge using a deductive strategy. By employing a combination of inductive and deductive research strategies, the study first explored specific constructs from existing literature to identify knowledge gaps before gathering data and incorporating these ideas into the data collection. Simultaneously, definitions and knowledge were derived from existing literature and data collection (Graebner et al., 2012), with the abductive approach guiding the analysis. The information provided by the stakeholders was initially described using their language and meaning as first-order concepts, followed by consideration of the objectives and identification of research gaps (discuss more in Section 3.6). Subsequently, this technical account was reconstructed or recaptured using the research objectives as second-order concepts (Ritchie et al., 2013).

3.3 Desk review

The desk review of the research study assisted in preparing the information and enhancing the researcher's confidence before conducting fieldwork and during data analysis. The researcher began by reviewing peer-reviewed journal articles, books, newspapers, and online materials from academic and semi-academic (including grey) literature. The review sources included government department websites that handle the areas and concerns relevant to BUW. Policy documents and government papers were initially studied to fully comprehend the BUW context (Appendix 1A). Archive materials, including photographs, maps, and recorded documents (Appendix 1B/1C) were collected and studied to understand the settings and the changes that occurred throughout history, also aided in study site selection. This data is predominantly presented in Chapter 4.

3.3.1 Document review and policy analysis

Policy documents were screened to assist in the creation of the study design and were also selected for document analysis. This was done to comprehend the rhetoric of the discourse in each document. The researcher selected policy documents related to BUW and their boundaries, specifically those relevant to the research areas of interest concerning flooding and heritage. The list of policy documents selected for analysis is found in Appendix 1A. Because the investigation began in 2021, any publications published after this date were eliminated.

The researcher employed document analysis or critical policy analysis (Taylor, 1997) to first understand the background of BUW from a management viewpoint, as well as to support data from the fieldwork (interviews and focus groups) later on. The process investigated how policy texts interpret flooding and heritage management. The relevant policy documents and project implementation reports were evaluated, and the documents were analysed to identify and capture the textual discourse (Ritchie et al., 2013). The study examined policy discourse on case boundaries and compared it to how actions have been carried out in practice (Winton, 2013). This primary task was to understand the knowledge underpinning policies to later comprehend how it contributes to the relationship between rhetoric and implementation. The study also sought to investigate the policy implementation on landscape change. The capturing of policy documents is primarily presented in Chapter 4. Later, certain policies were analysed after the first stage of data collection/analysis and are presented in the findings chapter regarding landscape value context (Section 5.6 Chapter 5).

3.3.2 Historical maps, photographs, and archival documents

The investigation explored how landscapes have changed over time (Antrop, 2005, Selman, 2012). This introduced a connection between the changed landscape and the primary group of actors influencing landscape transformation (Bürgi and Russell, 2001, Zube, 1987).

This desk review collated relevant data and maps related to the context of waterways in Bangkok to identify potential study sites for fieldwork. The information was gathered from national and international sources, including global open-source data. A large amount of data was interrogated related to waterways management, flood records, and elevation maps (see Appendix 1B). The study overlaid these essential data to select potential cases for more in-depth research at a later stage. This mapping process is presented in Section 3.4.1.

Information from old maps, historical images, and archival documents was gathered and evaluated to comprehend the changes in the physical context in urban waterways over time, including the beginning of the waterway administration. The researcher accessed historical archives from Thailand's National Archives, the Fine Art Department, as well as international library websites, e.g. the National Library of Australian (NLA), which housed collections of historical maps and photographs taken by foreign visitors during 1957 in Rattanakosin or Old Town Bangkok, including those related to the waterways area (Appendix 1C). Figure 3-3 provides examples, and more details are presented in Chapter 4. Chronicles written by Thai Kings during each era were also reviewed for events relating to the waterways area. Appendix 1C-D provides a table listing maps, pictures, and historical documents used in the study.



Fig 3-3 Historical photographs showing differences of water-level of the Ong Ang Canal during 1920-1940 (FAD, 2017)

3.4 Research design

3.4.1 Case study method and study site selection

The research adopted a case study approach as a preferred strategy in social science research to answer the question of "how" and "why" (Yin, 2003). The case study technique enables researchers to preserve holistic and significant qualities of real-life occurrences, which in this study include the organisational and managerial processes as well as neighbourhood development. Because the study propositions sought to interpret the alteration and value of urban waterways through the lens of landscape management, the research rationale permitted a logical understanding of the relationship between changes and values that occurred in specific physical location.

These premises guide the research, which adopted an approach to select potential cases to study the subjects under scrutiny in more detail. As a result, the single-case embedded design was chosen for this study, which includes the primary case and several sub-cases or units of analysis within the same context (Hays, 2004). Throughout the study, a single main context- Bangkok Urban Waterways (BUW)- with numerous units of analysis- three separate study sites were examined (Fig 3-3) since they can constitute a significant contribution to knowledge in a challenging context. The research did not intend to conduct a comparative study but rather to comprehend different contexts or settings in each individual site, each with its own set of circumstances in the BUW context. As a result, the researcher chose three eligible study sites from a much larger number (Fig 3-5) for in-depth data collection.

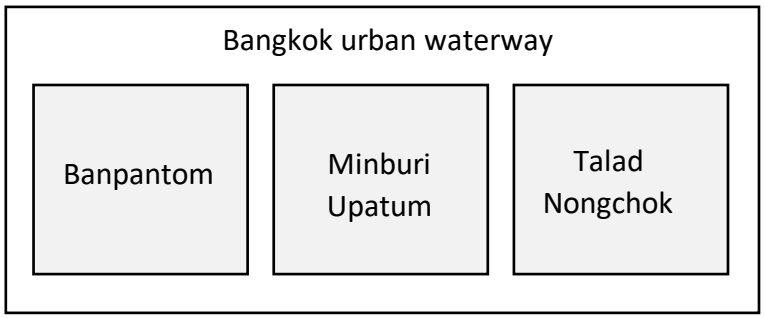


Fig 3-4 A single case of Bangkok urban waterway with the three different study sites as the units of analysis

The research developed study site selection criteria to screen potential sites and select/ discount them appropriately. The study sites were selected to ensure involvement by BUW's communities as key stakeholders (Fig 3-2). This followed the study proposition, which Yin (2003) describes as the attention that leads to something examined within the scope of the study to help identify the relevant information and prevent trying to research everything. The site study's selection criteria (Table 3-1) aimed to capture various and important differences in sites (Frantzeskaki et al., 2023) along BUW, with relevance to the research's focus.

1. variation of flood incidents and land cover
2. variation of management in conservation, urban development, and flood prevention
3. variation of existing roles of waterways and water edge.

Table 3-1 The site selection criteria

The criteria were overlaid to select study sites which were shortlisted from a large number. Table 3-2 shows the first stage before classifying them into category groups (stage 2) to frame the areas for recruiting interviewees and observing the waterways, as shown in Table 3-3. This process narrowed down to three study sites in the final stage for in-depth data collection and analysis, as presented in Table 3-4 (Fig 3-5).

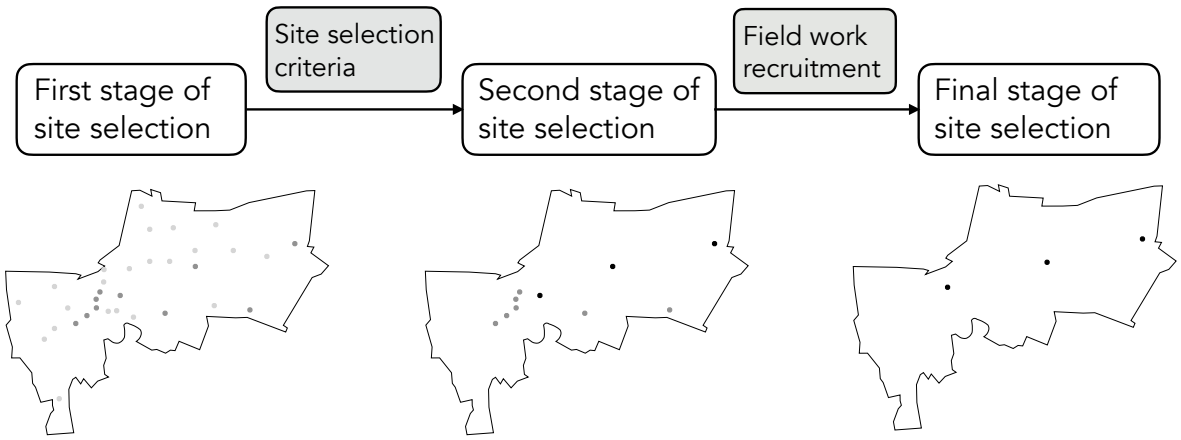


Fig 3-5 Process of selecting study sites from a larger number (also see Table 3-2 and Fig 3-8)

The study used map information; for example, flooding information (Fig 3-6) illustrates different types of important flood data in Bangkok. This includes maximum water extent data from surface water monitoring concerning the inter-annual behaviour of water surfaces between 1984 and 2020 (Pekel et al., 2016). Flooding events recorded between 2005-2020 by the Thailand flood monitoring system which categorise floods into “seasonal flood” or “significance flood”, lasting longer than 24 hours (GISDA, 2020). Additionally, urban vulnerable flood point, known as “urban flood” or “overland flood”, occur during heavy rainfall of at least 60 mm per hour in the build-up area, typically lasting from a few hours to less than 24 hours (BangkokGIS, 2019) (Section 2.3.3 Chapter 2).

For management information, Figure 3-7 shows the overlay of data sources from city development plans (BMA, 2019, TPD, 2017), conservation projects along the urban waterways (ONEP, 1994, ONEP, 2017a), and flood prevention projects (DSD, 2011, DSD, 2012, DSD, 2007, DSD, 2020a).

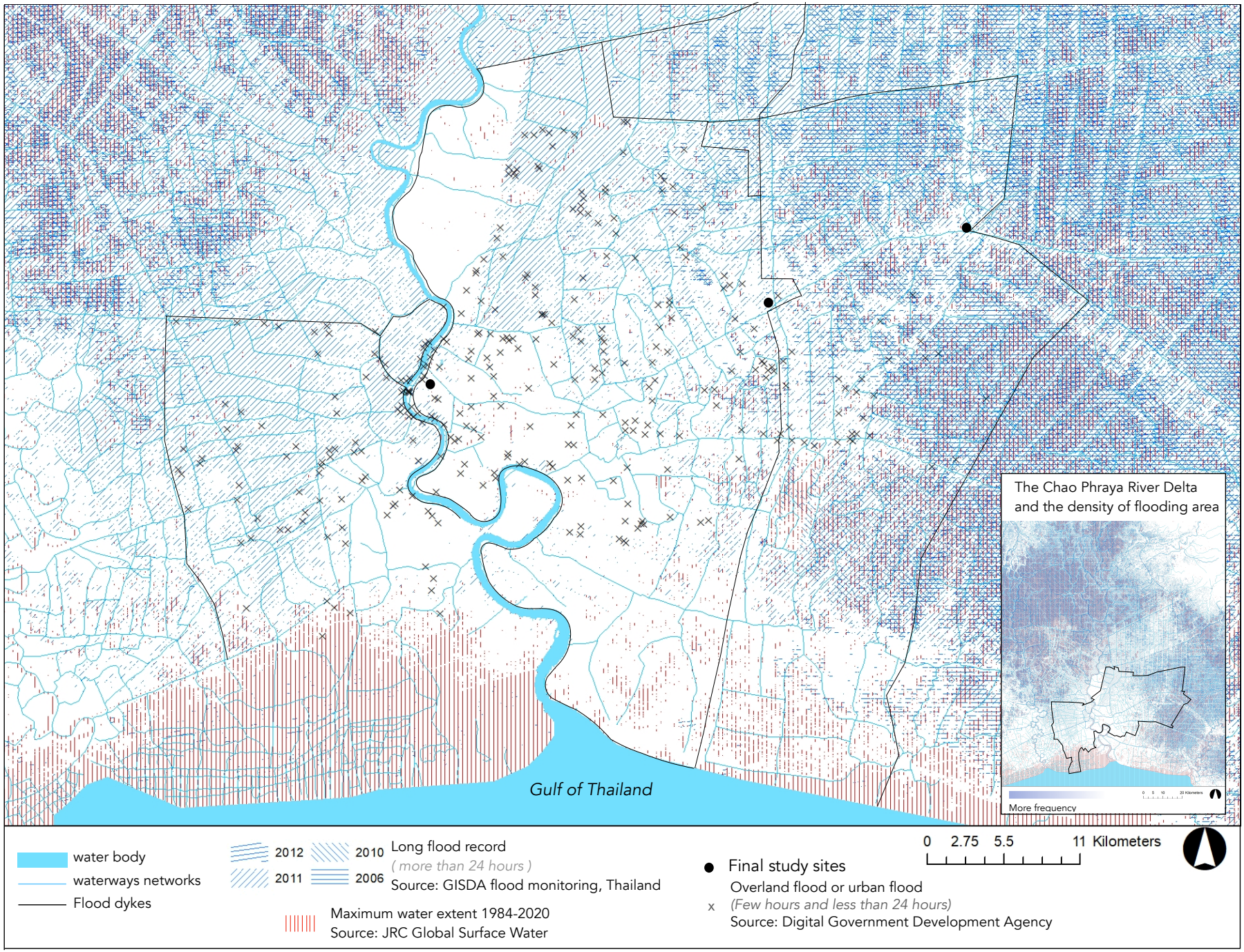


Fig 3-6 Bangkok Metropolitan Area and its impact flood area, utilised data from flood data using GIS spatial analysis.

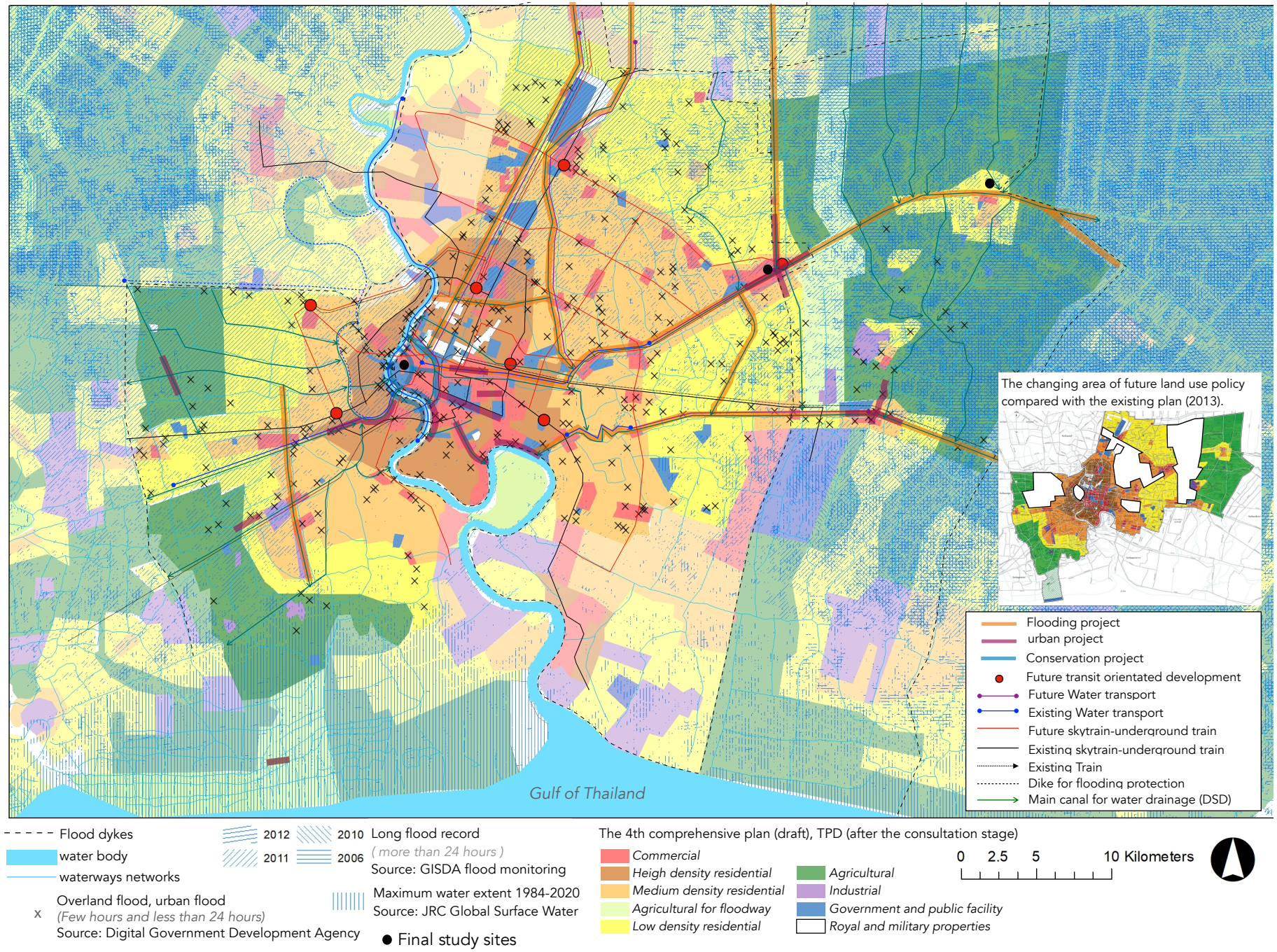


Fig 3-7 Bangkok Metropolitan Area and its policies involving BUW, including flood records, utilised data from policy documents

The first stage of selecting study sites

			Bang Plud - Muslim Bang Oh	Baan Vietnamese SamSean	Bang Lampoo canal	Pak Khlong Talad - Ta Tiean market	Ong Ang canal - China town	Kudi Chin - BangkokYai canal - Khlong San	BangRak neighborhood	Hua Lampong canal -Chong non Cee canal	Khlong Teai	Baan Krao- Sanseab canal	Minburi Sanseab canal	Samwa canal	saseab canal-floodway area	agricultural community eastside Bangkok	Nongchok Sanseab canal	Talad Hua Takea Praweat canal	Rom Kaow residential	Phra kanong canal	Talad poo Bangkok yai canal	TOD Bangwa Pasi charean canal	Sanam Luang community	Phraya Ratchamotee canal	Industrial community in Thonburi	Bang Phratun canal	Bang Ramad	Lad Prao canal	Pram Phrachakorn canal	TOD Bang Sea canal	Lad Prao canal- TOD Lak Sri	community development for elderly- Sai mai	Phraya Su Ran	Khlong Lam Jeak	Bang Kun Tean (mangrove-Shrime farm)
		Number on map	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	29	28	27	30	31	32	33
Location		*Riverside location*	x	x	x	x	x	x	x		x																								
		canal location			x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		the wide of canal (m) (0 = river)	0	0	20	0	7	30	0	3.5	0	16	20	17	25	12	11	20	10	20	24	20	25	12	10	7	10	27	17	15	27	10	15	7	20
(1)	Flood	*Pluvial, overland flood*	x	x	x	x	x	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	
		recorded Long flood (2006-2020)	1	1	1	1	1	1	1	1	1	1	2	2	3	3	3	2	1		1	1	1	1	1		1	1	1	1	1	1	2	3	
Variety of flood incidents and land use land cover		*maximum water extent (1984-2020)*														x	x	x																	x
	Land cover	*Vegetation area*												x	x	x	x	x								x	x								x
		Build-up area	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
(2)	project, policy	*The emblankment of canal*					x					x	xx	x			x	x		x		x		x				x	x	x				
	x at present	*The series of Dikes*		x	x	x	x	x	x	x	x		x				x																		
Variety of management	x (>10years)	*Consevation policy*			x	x	x	x																											
		Urban policy: Land use Policy change											x	x						x						x	x	x			x			x	
		Urban policy: redevelopment project				x	x	x	x	x	x	x	x					x	x		x	x	x		x							x			x
		Urban policy: future TOD project in/near site										x	x							x	x	x				x				x	x				
		Urban policy: distance from TOD (km)										2	0.5							1						2									
	state of project	*implemented*		x	x	x	xx	x	x	x	x	x	x				x			x				x					x					
	x at present	*implementing*		x													x			x				x				x	x	x	x				
	x (>10years)	*will implement*			x		x	x	x	x		x	x	x			x	x	x	x	x	x			x	x	x					x			
(3)	Function	*water markets*	x			x	x	x	x		x	x	x				x	x			x					x	x					x			
	x in history	*irrigation, food production*	x	x	x		x	x	x	x	x	x	x	x	x x	x x	x x	x		x	x	x				x x	x x	x	x	x	x				x x
	x at present	*historical waterways housing pattern*	x	x	x	x	x	x	x			x	x	x	x x	x x	x x	x x		x	x	x				x x	x x	x	x	x	x				x x
		Life service (fishing, bathing, etc.)	x	x	x		x	x	x	x		x	x	x	x x	x x	x x	x		x	x	x				x x	x x	x	x	x	x				x x
		local transportation			x	x	x	x	x x	x	x	x	x	x	x x	x x	x x	x x		x	x	x				x x	x x	x	x	x	x				x x
		Public transportation	x x	x x	x x	x x	x	x x	x x	x	xx	x x	x x	x	x		x x	x		xx	x	xx				x	x	x	x	x	x				
		Tourist transportation		x	x	x	x	x	x												x														
		future policy transportation			x								x					x		x	x							x	x		x				x
		drainage channel by Drainage dpartment	x	x		x	x	x	x		x	x	x	x	x		x	x		x	x	x	x	x		x		x	x	x	x				
		currently water edge accessibility		x									x	x		x	x	x		x	x					x	x								
	change type	*Fragement waterway*		x	x	x	x	x	x	x	x	x									x	x				x									
		emblankment waterways edge	x	x	x	x	x	x	x	x	x	x	x				x			x		x	x	x	x			x	x	x	x	x	x	x	
		natural waterways edge											x	x		x	x	x		x	x					x	x								x
		POTENTIAL SCORE	0	/	//	//	//	//	/	/	/	//	///	0	0	0	///	///	0	///	//	/	0	0	0	///	/	0	0	0	/	0	0	0	0

Table 3-2 The list of sites along the BUW (columns) and their potential scores given by using three criteria

Eleven Selected sites

Process of selecting study sites

Table 3-2 shows the first stage of selecting the study sites, where eleven sites were chosen and categorised into three clusters (Table 3-3 and Fig 3-8); four sites in the inner conservation urban waterway (a), four sites in the densifying residential urban waterway (b), and three sites in the agricultural and/or urban waterway on the outskirts (c).

Waterways grouping		(a) The inner conservation urban waterway	(b) The densifying residential urban waterway	(c) The agricultural or outskirt urban waterway
Conservation waterways and San Seab Canal	(i)	Pak Khlong Talad	Ban Krua	
	(ii)	**Bann Pan Tom**	**Minburi**	**Nong Chok**
South-Eastern waterways	(iii)	Chinatown	Phra Kanong	Talad Huatakea
Western waterways	(iv)	KudiChin	Talad Poo	Bang Phratun

Table 3-3 The potential study sites (refer to symbols with the location in Fig 3-8)

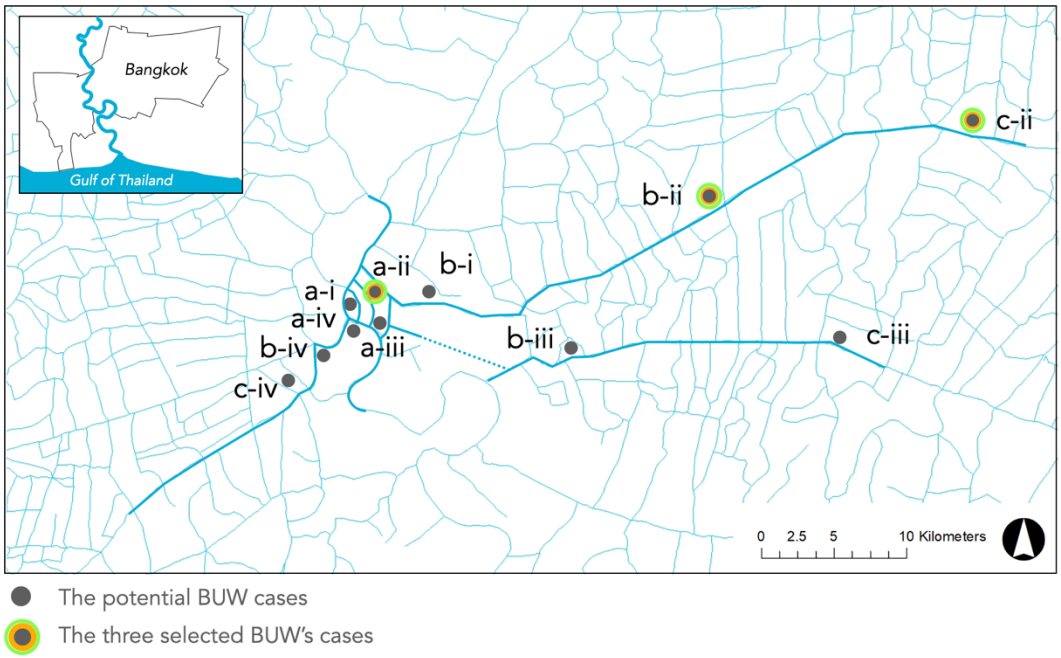


Fig 3-8 The selected sites using case study selection criteria

Three locations, labelled (a-ii), (b-ii), and (c-ii) (Fig 3-8), were chosen for thorough investigation during the recruitment of interviewees for the initial phase of data collection with residents. These sites served as the foundation for gathering information for subsequent stages of data collection. The study, therefore, primarily focused on the cluster of conservation waterways and Sanseab Canal (i),(ii), along with the BUW at the city scale.

Study site/ community (CO)	Flood events	Land cover	Management	Waterway
Banpantom CO-01	No flooding	Built-up area	Protected area, commercial area Finished/ongoing conservation plans Finished/ongoing redevelopment plans	Embankment
Minburi Upatum CO-02	Urban (flash) flooding/ Significant flooding	Built-up + less green area	High residential, commercial area Ongoing urban development plans Ongoing TOD, boat transportation Ongoing water treatment project Inside the royal flood dyke	Embankment
Talad Nongchok CO-03	Significant flooding	Built-up + green area	Low residential, agricultural area Outside royal flood dyke Ongoing flood protection project	Embankment+ natural edge

Table 3-4 The final three study sites with the variation of information-oriented selection

Variation of flood incidents and land cover

The selected study sites encompass both areas within (CO-02, CO-03) and outside flood impact zones (CO-01) to capture different types of flood and understand interpretations related to floodwater across a densely populated urban city, encompassing a broad range of flood scales and forms (Fig 3-9). The selected study sites include both built-up (CO-01, CO-02) and less dense/ more vegetated areas (CO-03) (Fig 3-10) to capture the full spectrum of urbanisation and future change in the area of interest.



Fig 3-9 Flood information of the three selected study sites

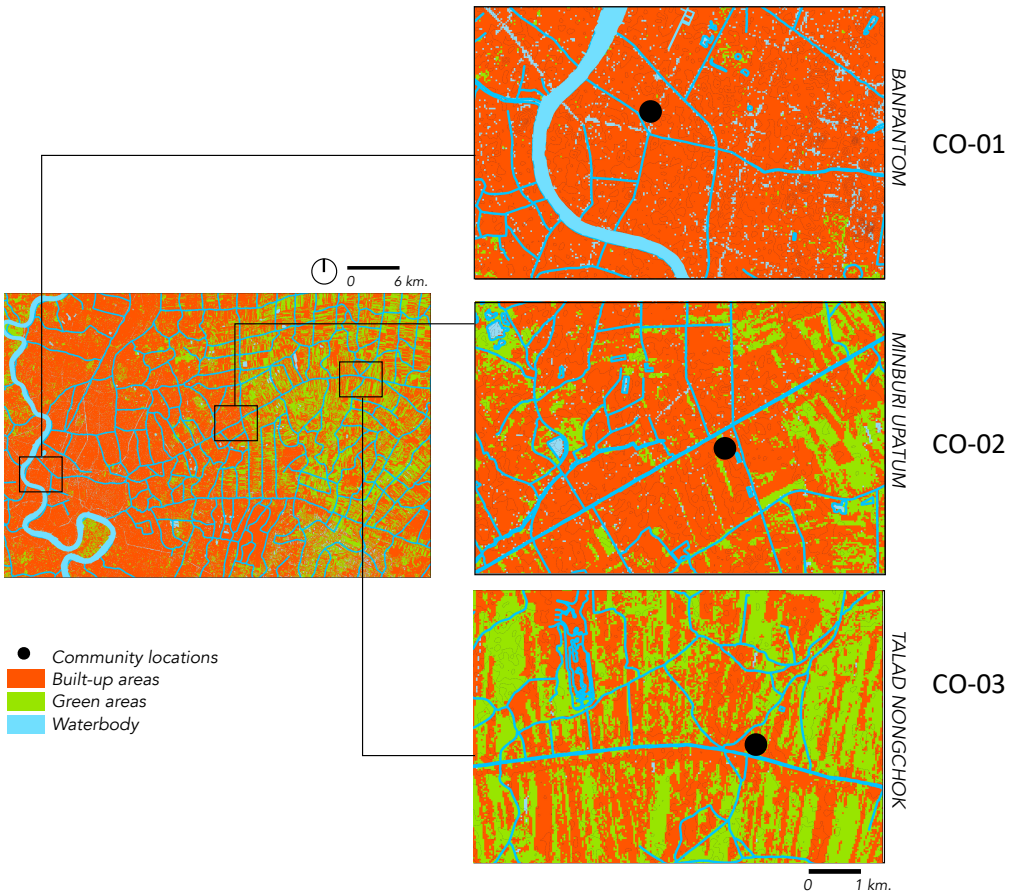


Fig 3-10 Land cover of the three selected study sites (Esri, 2021)

Variation of management

The study site selection was made according to their location inside (CO-01, CO-02) and outside the flood dykes (CO-03) and in the protected conservation border (CO-01) (Fig 3-11). In addition, projects involving BUW (DSD, 2017-2020), which aim to replace water edges with dams to prevent floodwater and increase drainage capacity, were also considered (CO-03). To better understand conservation management, the study selected sites focusing on historical waterway communities located around the historic waterways (ONEP, 2017) with at least one implemented project (CO-01). To address urban policy, the research considered sites along the urban waterways located in the future land use plan changes, sites surrounded by Transit Oriented Development (TOD) projects, with future water transportation and other urban redevelopment projects (CO-02) (TPD, 2019). This was to capture the changing landscapes of study sites in the future and had reliable information for processing future management alternatives.

Variation of waterway roles and types of water edges

The sites had varied physical patterns of water edges, including natural edges (CO-03) and embankment edges (CO-01, CO-02), and a variety of water edge accessibility. The study considered the functions of waterways in historical and present times as indicators. The study sites represent areas where historical functions are maintained (CO-03) and where the

waterway function has changed (CO-01, CO-02) and will change according to future management (CO-03). More detailed descriptions of each site are provided in Chapter 4.

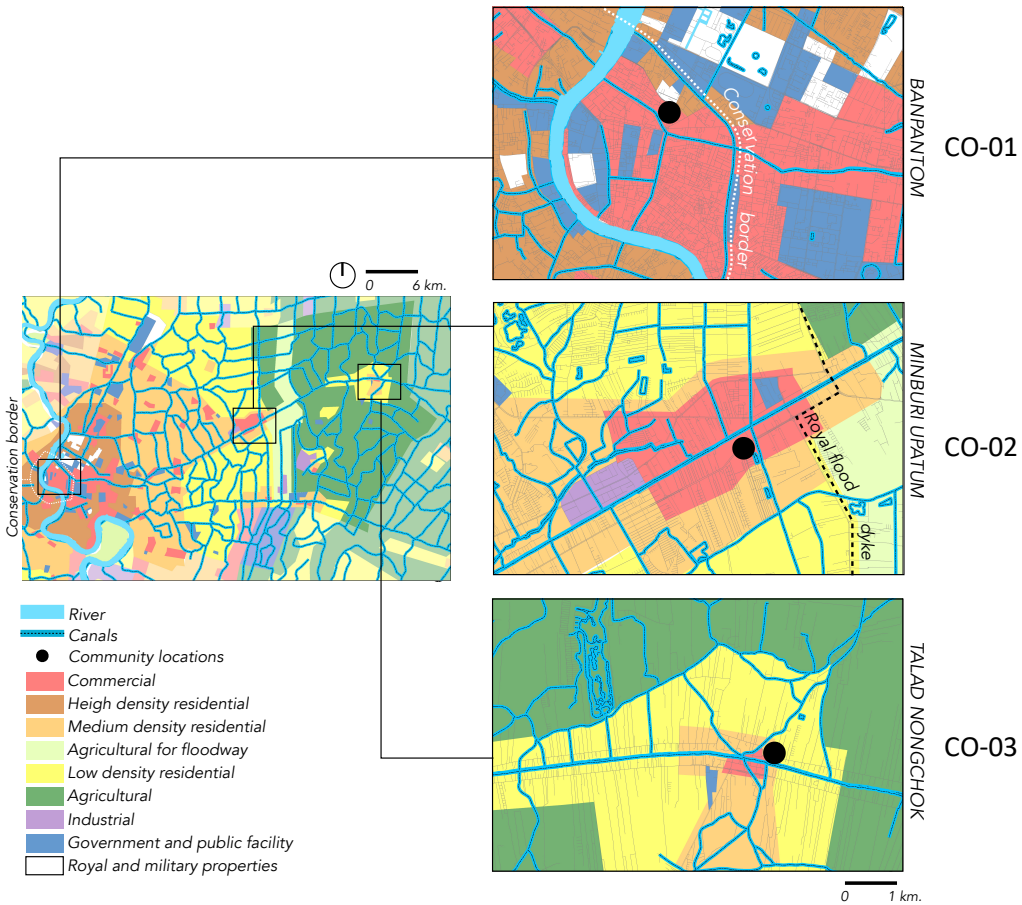


Fig 3-11 Land use from the 2020s Comprehensive Plan of the three selected study sites

3.4.2 A qualitative approach to participant selection

The study adopted a qualitative approach to collect the data from relevant stakeholders on an institutional scale (see Fig 3.2), an essential factor in influencing landscape change (Bürgi et al., 2004) (Section 2.2.3). Borrowing from ethnography, the study focused on an interpreted understanding of the multi-stakeholders' responses by analysing the sense they made of their own circumstances, perspectives, and histories (Ritchie et al., 2013). The study collected data from stakeholders, including government agencies to gain insight into their organisation's role in positions of power (Faria and Petintseva, 2021), their performance practices, and organisational routines (Merkus et al., 2019), including their utilisation of knowledge (Todt and Lujan, 2014). This was supplemented by local knowledge gathered from residents (Raymond et al., 2010).

This qualitative approach used to underpin the data collection (Graebner et al., 2012) was divided into two phases. The first stage involved interviews, and the second involved focus groups. The diverse roles of stakeholders identified for interviews were engaged to participate in the subsequent focus group or workshop (Fig 3-12). This involvement was

facilitated by utilising the analysed data from interviews deemed relevant for organising the activities, as outlined in more detail in Section 3.7.

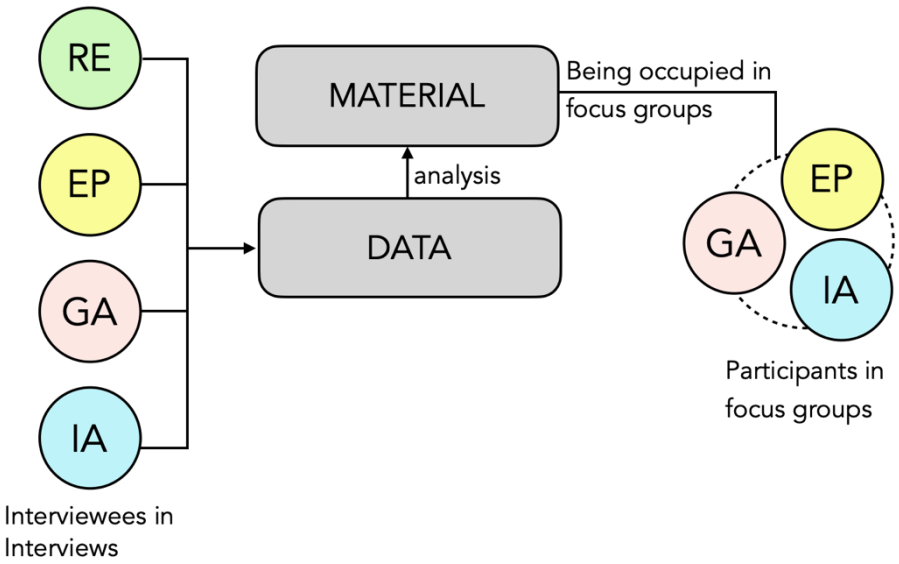


Fig 3-12 Diagram of interviewees and participants in data collection (RE= residents, EP= Experts, GA= government agencies, IA= NGOs, international agencies)

Interviewees

The interviewees were selected from among the different stakeholders associated with BUW (also see Appendix 1E). The individuals were chosen because they are: the people who control or make decisions in the area: government agencies (GA), NGOs or international agencies that have been involved or are interested in the BUW context (IA), experts and practitioners (EP). Residents in three selected communities were included in the sample (RE). These individuals were chosen because their positions that have (been) affected by, or caused, the BUW area suited the research questions that attempted to describe the change, value, and management of the BUW, which addresses RQ 1 and 2.

a. Government agencies (GA)

The agencies included water management agencies related to wastewater and rainwater management, including flood prevention, drainage capacity, and wastewater system improvement. The proposed GA in the sample also included town management agencies, as urban settlements have developed along the waterways, which include the residential areas and public spaces, and the development of water transportation as it occurred in BUW to support the city. The study, moreover, included conservation management agencies of BUW, which contain information on the historical area management where there are historical waterways located in the conservation boundary. The research involved a total of seven people/agencies, both from national agencies and agencies under the Bangkok Metropolitan Administration (BMA).

b. NGOs or international agencies (IA)

Interviews were carried out with two international organisations: ICOMOS, which possesses expertise in preservation, and UN-Habitat Thailand, with a more direct focus on issues related

to habitation inclusivity in Bangkok. Both organisations provided an international perspective when examining BUW in this context.

c. Experts and practitioners (EP)

The interviewees included academics and practitioners who work in the BUW context, dealing with heritage areas and/or water issues such as floods or the issues of the BUW community. The practitioners also included those who have experience working with government agencies. The academics have knowledge related to BUW and/or are interested in the BUW area concerning the flooding situation or management, heritage, culture or historical dimension, land management, and the government system of Bangkok. A total of ten interviewees were interviewed in this category.

d. Residents in communities (RE)

Three study sites were selected: Banpantom- conservation community area, Minburi Upatum- high residential area, and Talad Nongchok- outskirt Bangkok centre. The study included three to four residents in each site, including community leaders, for a total of ten residents from three sites. Leaders were recruited based on their experience in communicating with agencies. Residents participating in the interviews were recruited if they were middle-aged, around 45-50 years old, capable of walking and engaging in public conversations. This selection criterion aimed to capture historical insights into policy implementation and gather first-hand knowledge of changes in BUW's community spaces.

Focus group participants

In the interview phase, the interviewees' roles, which were strategically categorised as EP, GA, and IA, were aimed at engaging in the focus group stage. During this focus group stage, the study organised participants based on their roles or positions to investigate the utilisation of knowledge and decision-making processes among policymakers and practitioners, addressing RQ3. Consideration was given to their specific field of knowledge or expertise, encompassing waterbody experts (WB) and place-making experts (PM) within the BUW context. This classification is pivotal because BUW not only pertains to waterbody knowledge and management but also integrates the surrounding area along the waterway, as elucidated in the rest of the thesis, establishing a multifaceted relationship with the place-based knowledge of the urban and heritage context. The participants were further divided into three positions: academics (AC), practitioners (PR), and government agencies (GA).

The study recruited three persons per group and formed eight focus groups (Fig 3-13), with each group comprising WB and PM experts, both from the new participants and the interviewees from the first stage who agreed to participate in the focus group. This was to accomplish the goal of differentiation of knowledge employed within their decision-making process. If possible, the study attempted to recruit AC, PR, and GA in the same group (Fig 3-13). However, the study was able to keep the group combination of two separate knowledge, WB and PM, when the combination position of AC, PR, and GA in the same group was not possible due to recruitment limitations. There were 24 participants in total, and eight focus groups were held (Fig 3-14; also Appendix 1F).

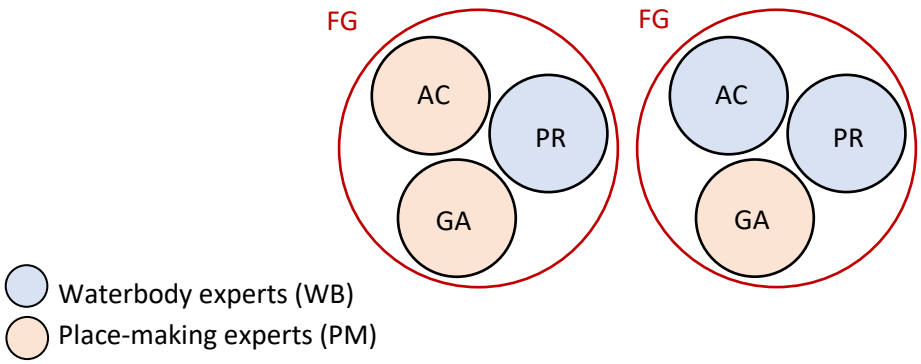


Fig 3-13 The proposal of perfect focus group (FG) combination

a. **The waterbody experts (WB)** included people who worked in water management agencies or practitioners or academics who have knowledge of built environments or water resource engineering (BE) and floods resilience or hydrology or ecology or landscape architecture with an interest in flood management (FE). The participants in WB included 12 people altogether.

b. **The place-making experts (PM)** included those working in urban or town planning or conservation agencies or practitioners or academics who have knowledge of urban planning or town management or Bangkok governance or political science (UP), and historical or heritage or cultural landscape or conservation management (HC). The participants in PM included 12 people altogether.

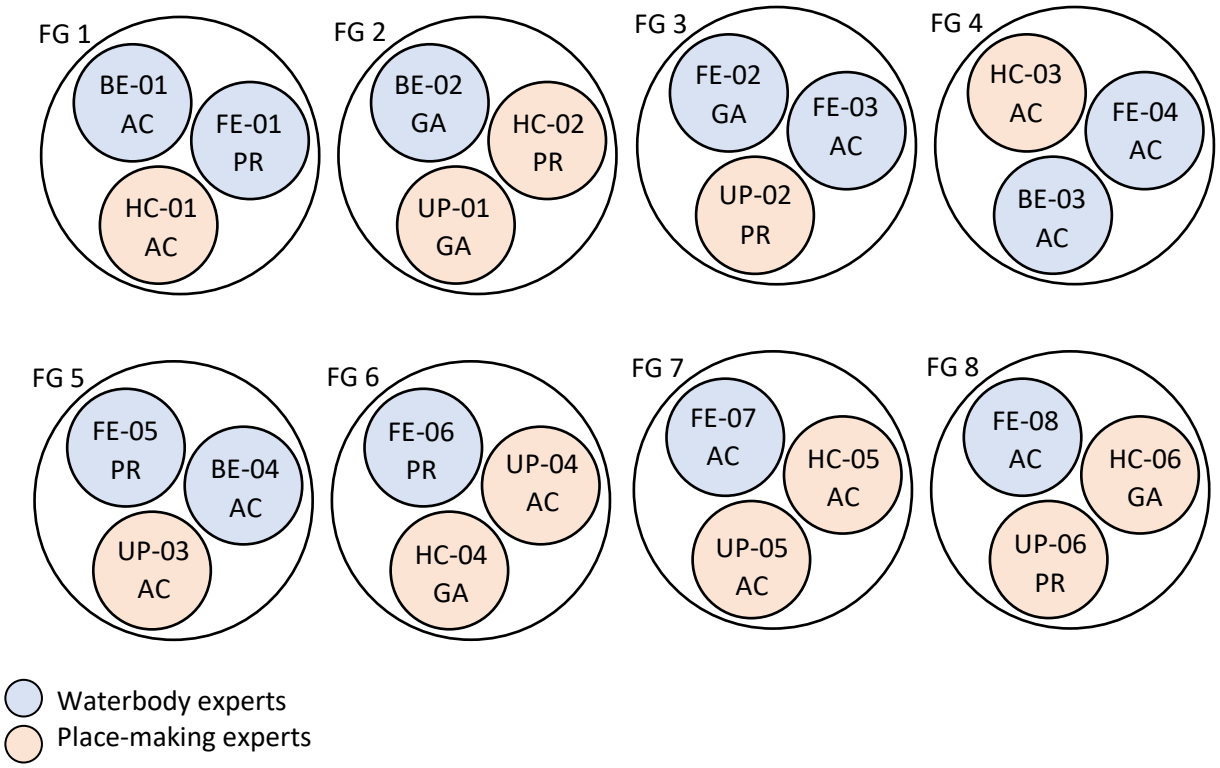


Fig 3-14 Combinations of participants in the eight focus groups

3.5 An iterative approach and the sequential research design

The iterative approach (AQR, 1980) was utilised in this research entails repeating a process or cycle specifically through: deskwork and data collection, within the workshop activities (Appendix 1K), and within the data analysis process (Section 3.6). The sequential data collection was designed and conducted (Fig 3-12), with refinements in the later stage guided by insights gained from the first stage (Tracy, 2018).

After the first round of interviews, the researcher assessed the data and created materials for the focus groups as a toolbox for processing and analysing data collected (Fig 3-15). In subsequent rounds of data collection, the material also generated a dialogue (Oreszczyn and Carr, 2008). The research materials were employed to create different scenarios (Dinka and Lundberg, 2006), which have been widely used as a strategy tool by researchers interested in the causes and implications of what might happen in the future (Moniz, 2005, Bruaset and Saegrov, 2018). However, it is not the prediction of a specific future but rather describes a possible set of future conditions related to the topic of research interest (Oreszczyn and Carr, 2008), which in this thesis is the landscape change of BUW. The material was designed to depict possible events and trends as they develop to inform decision-makers (Sharpe et al., 2016) and explore their influence (Ratclie, 2000).

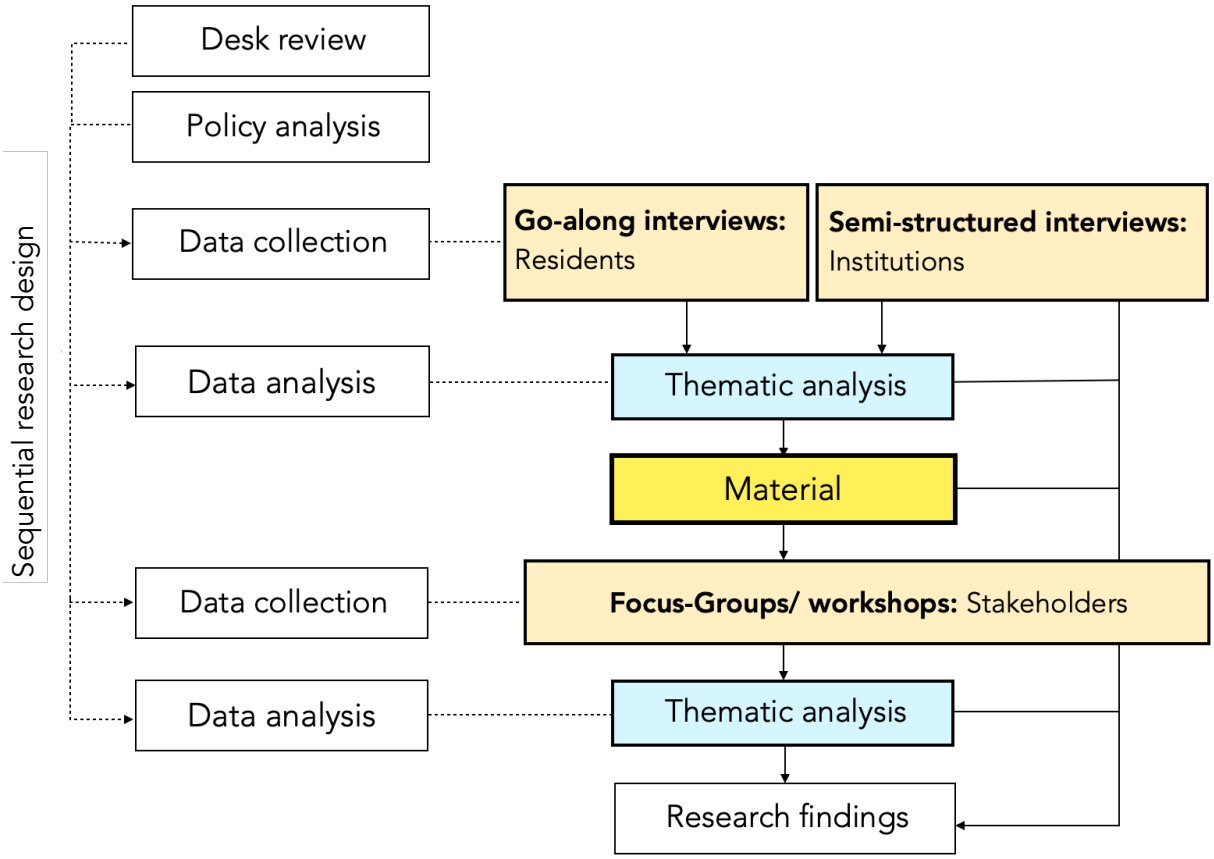


Fig 3-15 The methodological approach in this research

The statements and described actions taken by the various stakeholders during workshops allowed for an iterative approach to identifying decisions that reflect the professional roles of participants and the identity and influence of attitude systems (Dinka and Lundberg, 2006). This iterative approach facilitated capturing stakeholders' knowledge, prioritisation, and exploration of how landscape knowledge influences issues related to flooding and heritage management.

To help shape questions for sequential data collection, the study used the **"three horizons approach",** the temporal framework dealing with complex problems and perspectives (Sharpe et al., 2016). This guided the participants to engage in conversations around complex problems and uncertain futures, creating a dialogue with different people's mindsets and values. The three horizons led the researcher to develop dialogue or questions (see Appendix 1J/1K) to process the data collection of both stages of fieldwork:

> **The first horizon:** In the interview phase addressing RQ1, interviewees were queried about changes in BUW's landscape, historical and cultural contexts, and their connections with waterways, including alterations due to ongoing projects. The first horizon emphasises the importance of understanding the current situation to instigate change, as Sharpe et al. highlighted.
>
> **The third horizon:** The interview phase also incorporated the third horizon to investigate prospective management alternatives, aligning with RQ2. This horizon was utilised to envisage an ideal vision for specific BUW situations at each study site, investigating the visions and values articulated by each stakeholder. These were mainly used as materials for the focus group in the later stage.
>
> **The second horizon:** In the second stage addressing RQ3, the research adopted the second horizon when conducting focus groups to explore how future changes were perceived in reality, considering navigational challenges and pathways from the current state. This phase involved open discussions, testing the efficacy of collective sharing in a workshop setting, where various experts related to BUW engaged in integrating and sharing their knowledge.

3.5.1 Researcher positionality

The researcher, a Thai university lecturer, facilitated effective engagement with experts and practitioners in Bangkok. The academic culture in Thailand, which values the exchange of experiences and knowledge, contributed to a smooth recruitment and data collection process among academics and practitioners. However, the researcher's dual identity as a female Thai citizen and a Ph.D. student presented challenges when interacting with government entities. Government agencies, inclined to safeguard their information and wary of 'outsiders,' posed difficulties. Unlike foreign researchers with international affiliations, the researcher faced limitations in establishing connections with government entities. While Thai companies typically collaborate with Western institutions, the absence of a foreign identity or an invitation from a global organisation like the United Nations detrimentally affected the researcher's access. Additionally, the researcher's role as an outsider and academic initially

created discomfort among residents. Nonetheless, as a native Thai speaker, the researcher assured residents that the study aimed to bring no harm or instigate any tangible changes to the communities, which helped build trust.

3.5.2 Interviews (The first phase)

Semi structured interview

The study used semi-structured interviews since they foster discourse and allow stakeholders to express their opinions (Adams, 2010, Rabionet, 2011). It allows interviewees to steer the conversation (Hanna et al., 2016). Questions were not listed in any particular order, enabling the researcher to modify or rearrange them based on the participants' responses (Kvale, 2011). Unlike structured interviews, where the same questions are asked of each participant without deviation (Bryman, 2016), this approach aims to elicit diverse responses. However, interviewees still needed to answer from the researcher's guildeline questions, making the interviews structured to a degree (Ritchie et al., 2013).

The semi-structured interviews were conducted both on-site and online based on each interviewee's request (Appendix 1G). The researcher planned to conduct the interviews for around 60-90 minutes following the list of questions (see Appendix 1J). However, some participants took much longer than expected because they appreciated engaging in a conversation about their area of expertise.

Go along interview

A go-along interview with notes and photographs taken of the waterways and at the three study sites was conducted with residents (RE) from each three communities, using the same pattern of questions from the semi-structured interview (Appendix 1J). This outdoor-based, on-site method helped develop a rapport between residents and the researcher through place (Carpiano, 2009), i.e. BUW. This is because go-along interviews can encourage a sense of connection with the study area when the researcher and residents walk and talk together (Stiegler, 2021). Furthermore, the technique proved useful in gathering a variety of material, such as historical images. This mobile form of the interview took place in the community spaces, which was helpful for residents to lead the researcher to the locations they mentioned (Rishbeth, 2020).

Because these interviews were performed in outdoor areas and involved walking from one location to another (Fig 3-16), they took much longer than the institutional interviews. A typical go-along interview lasted two to four hours. The researcher evaluated the information from the residents immediately after each interview to see whether the data from the residents was repeated. The number of residents, therefore, was not equal across the three sites (see Appendix 1H).



Fig 3-16 The go-along interview with the community leader at Talad Nongchok

Site-survey

The researcher engaged in some surveying and unstructured observation (Mulhall, 2002) at the three selected communities (Fig 3-17) to gather data alongside resident interviews to generating materials for phase two. Additionally, the data was used to explore physical changes in the landscape, depicted through sections created for schemes and scenarios (see Section 3.7). Although the study selected the three settlements along the BUW for data collection, other potential waterways were nevertheless examined and photographed for a wider understanding of the environmental context (Preissle and Grant, 2004) of BUW in Bangkok (see Appendix 1L) .

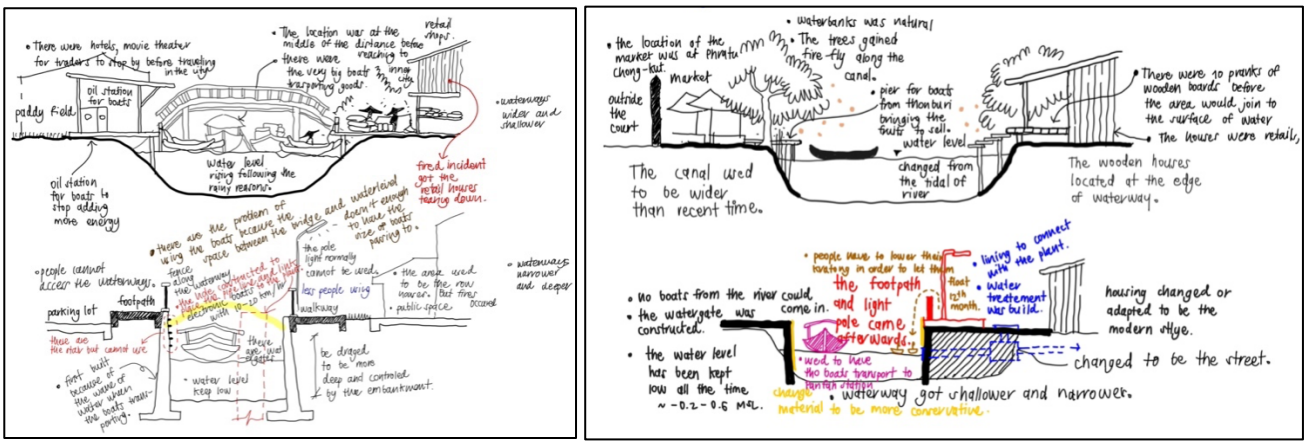


Fig 3-17 Examples of hand sketches and notes taken during the survey at Banpantom (Right) and Minburi Upatum (Left) translated into English.

The first phase lasted from November 2021 to July 2022, encompassing both the dry season (Jan-Apr) and the flood season (May-July). During the flood season in June-July 2022, the researcher noted of the water levels from the river that connected to the study site. This approach was also complemented by a desk assessment from the DSD website. This data was utilised to analyse the operation of the watergates during the flood season and was reviewed alongside other findings in the findings chapter (Appendix 1L). Site surveys helped the research understand and integrate the information more rigorously with other findings (Mulhall, 2002).

3.5.3 Focus groups/ workshop activities (The second phase)

The study opted for the focus group as a research method to investigate the final research question (RQ3). Utilising the focus group is deemed suitable for capturing participants' perspectives (Nyumba et al., 2017) and examining how they formulate views (Akyildiz and Ahmed, 2021) through interactions, potentially eliciting a shared perspective (Kitzinger, 1995, Bryman, 2016), including processing their decision-making. The workshop's activity was designed to assess collective sharing, shared expertise, and open discussion (Herk et al., 2011), aiming to understand whether and how collaboration or involving various experts could construct solutions (Loschner et al., 2016) for complex issues such as climate change and flooding (Söderholm et al., 2018) in the intricate BUW.

The focus groups included interviewees who had agreed to take part in the follow-up research after the interviews in the first phase, along with additional individuals willing to participate. Eight focus groups took place on-site or face-to-face between January to March 2023. The focus group exercise involved discussion about the BUW city scale and the study site scale, with each of the eight groups discussing one of the three study sites. Three groups discussed CO-01/Banpantom, three other groups addressed CO-03/ Talad Nongchok, and two other groups discussed CO-02/ Minburi Upatum (Appendix 1I).

The researcher's created materials detailing the analysis process are explained in Section 3.6, with a comprehensive presentation in Section 5.4 Chapter 5 as an integral component of the research findings. However, for a concise understanding of the focus group process, it is essential to provide a brief overview of these research materials here. The materials included small cards (Felstead and Thwaites, 2023) and sets of sections created, derived from the interview data. There were 16 schemes (Fig 3-25) and five scenarios (Fig 3-26) relating to BUW alterations at the city scale and the three community contexts. The participants were asked to engage in activities with these provided materials, which were divided into two activities (see question list in Appendix 1K).

Activity A: The overall BUW scale discussion activities began with participants arranging schemes on the table and discussing them with one another. Following this, participants were asked to choose or prioritise the scenarios of the five management approaches and discuss them (Fig 3-18).

Activity B: The study site or community scale discussion activities began with participants selecting or prioritising the five scenarios according to the context of the community they were provided. Following this, participants discussed and provided shared visions utilising the materials. After conducting their shared vision exercise, participants were asked to discuss the obstacles and address the solutions to the shared visions they proposed (Fig 3-19).




Fig 3-18 Discussion of BUW schemes through the small cards (Left), and scenarios through the diagram sections (Right)

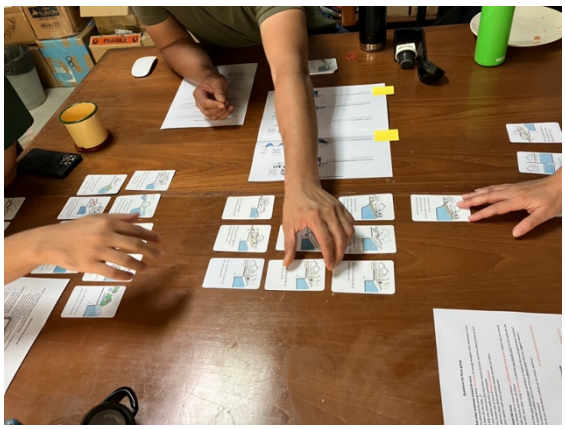



Fig 3-19 Discussion of Banpantom's scenarios (Left), and of shared visions through materials (Right)

3.6 Thematic analysis

To analyse the data collected from the interviews and focus groups using qualitative approaches, thematic analysis (TA) (Braun and Clarke, 2020, Braun and Clarke, 2006) was employed. The data analysed via TA served a dual purpose in this research: it not only contributed to addressing the specific research questions and delivering the key findings but also facilitated the development of research material (Section 3.7).

Thematic analysis is commonly used to identify, analyse, and report patterns or themes within data (NetCen, 2012). Emerging themes from question-led responses and emergent discussions are analysed to explore how people give meaning to the situations they describe (Ritchie et al., 2013). This TA manages and describes the dataset in detail (Braun and Clarke, 2020) through codes and categories, and links between categories and themes (Ritchie et al., 2013, Smith and Firth, 2011).

This process allowed the researcher to identify patterns in the coded transcripts (Meehan, 2021) of stakeholders' perspectives, experiences, and perceptions of landscape change, value, and management. This data coding system provided descriptions, and linked codes with data to form overarching themes (UOA, 2019, NetCen, 2012). The researcher used NVivo software to process and analyse the data (Meehan, 2021). Thematic analysis permitted both case-based and theme-based analyses, also aiding in the investigation and development of materials in the first stage.

This study focused on understanding the overall patterns of meaning within the entire dataset (UOA, 2019, Braun and Clarke, 2006), as opposed to emphasising unique qualities or individual datasets as seen in interpretive phenomenological analysis. Therefore, TA aligned with this research approach. Unlike grounded theory analysis, the research did not aim to build a theory but sought to contribute to and address a knowledge gap. This research adopted TA for its flexibility and ability to adapt to the data obtained in the research (Guest et al., 2012).

The abductive approach was used in the TA following the overall research framework of abductive methodology (refer to Section 3.2.2). The researcher applied the systematic process of TA from Braun and Clarke (2006, 2012), including: becoming familiar with the data, generating initial codes, searching for themes, developing and reviewing themes, defining themes, and writing up the findings (Byrne, 2022, Braun and Clarke, 2020, Meehan, 2021, NetCen, 2012). The researcher also referred to the abductive guide in thematic analysis by Thompson (2022), including: data familiarisation, coding, codebook, theme development, theorising or operationalisation, comparison of the dataset, data display and writing up.

Following these two analytic procedures, the researcher applied them to the systematic method of this study, which includes six processes: 1) familiarisation with the data, 2) inductive coding, 3) deductive coding, 4) operationalisation, and 5) data presentation or display before writing up.

1) Familiarisation with the data and data organisation

The researcher became acquainted with the data by transcribing and taking notes during the interviews (Guest et al., 2012, Thompson, 2022). Transcribing also assisted the researcher in determining the next steps of data collection, such as whether the data was sufficient for analysis. Questions were asked, such as: Does the study require more participants? Is the data repeated? The data were organised using the Nvivo software's "attribute" and "case classification" capabilities to categorise the dataset (Meehan, 2021). Each set of data components (e.g. a focus group transcript) was grouped and classified according to the research objectives. Furthermore, the data organisation aided the subsequent presentation of the findings. The data was displayed by/from viewpoints that were appropriate and relevant to the findings and research objectives during the analysis process.

Interview data

The interviewees were grouped into three different sets. The NVivo software process used here was 'attribute' to help cluster the data. These sets included: the stakeholder types, which included all interviewees and were clustered into IA/GA/EP/RE; and the community cases, which included only the RE and were clustered into three sites according to the case studies: CO-01: Banpantom, a conservation community; CO-02: Minburi Upatum, a high residential community; and CO-03: Talad Nongchok, an outskirt community.

Focus group data

The study used the attribute function to group the data from the focus group by the two main knowledge types and the three case contexts. The participants from the focus groups were clustered by their knowledge of experts: WB/PM, following the area of interest in the BUW relationship. The WB group included BE/FE, and the PM group included UP/HC (refer to Section 3.4.2). Each group was also clustered by the community in which they conducted activities: CO-01, CO-02, and CO-03.

2) Inductive coding

This process is an initial decode or open-code which is a way of coding without considering the research purposes, originally using an inductive approach to analysis the data (Ritchie et al., 2013). The researcher first did the coding without considering the research questions, instead focusing on the information within the data (Guest et al., 2012). The questions guiding data collection were naturally employed to determine the code names. The transcripts were thoroughly examined, and sentences were labelled based on their contextual information and intended meaning (Meehan, 2021). Semantic or explicit codes were created following this exploratory transcript process. This process also allowed the data to be neater and more easily categorised (UOA, 2019, Braun and Clarke, 2020). Following the process of decoding, the dialogues were sometimes decoded more than one code if the sentences described more than one aspect or meaning, as shown in the following examples.

Example A:

The researcher initially decoded this dialogue as "agency communication with residents." This decision was based on the understanding that the sentences conveyed how conversation occurred between residents and agencies.

"Usually, the authorities would approach us and discuss the construction project around this canal before commencing. However, when they engaged with us, they often selected only one individual to speak with, effectively silencing the rest of us. They sought to designate this individual as the representative, despite the fact that he or she did not truly represent us." RE-05

Example B:

Initially, the researcher assigned two codes, namely "History of community" and "Benefits of waterways," to the given dialogue. This decision was based on the understanding that the sentences conveyed both the historical social aspects of the community and the functional significance of the waterways.

"Historically, this community was inhabited by numerous high-ranking government officials and noble families due to its proximity to the palace and waterway. This also encompassed individuals engaged in crafting activities such as silver crafting, sculpting, and nielloware making. They utilised the canal water for the crafting processes." RE-01

This stage required the researcher to spend time analysing the data and developing new codes that could be repeated. Each code had its own files and references, indicating how many times the participants mentioned a code (Fig 3-20). These two numbers indicated to the researcher whether the code received many or few references. Subsequently, the researcher progressed to the next stage of deductive coding when confronted with an excess of codes and challenges in locating specific codes within the dataset (Meehan, 2021).

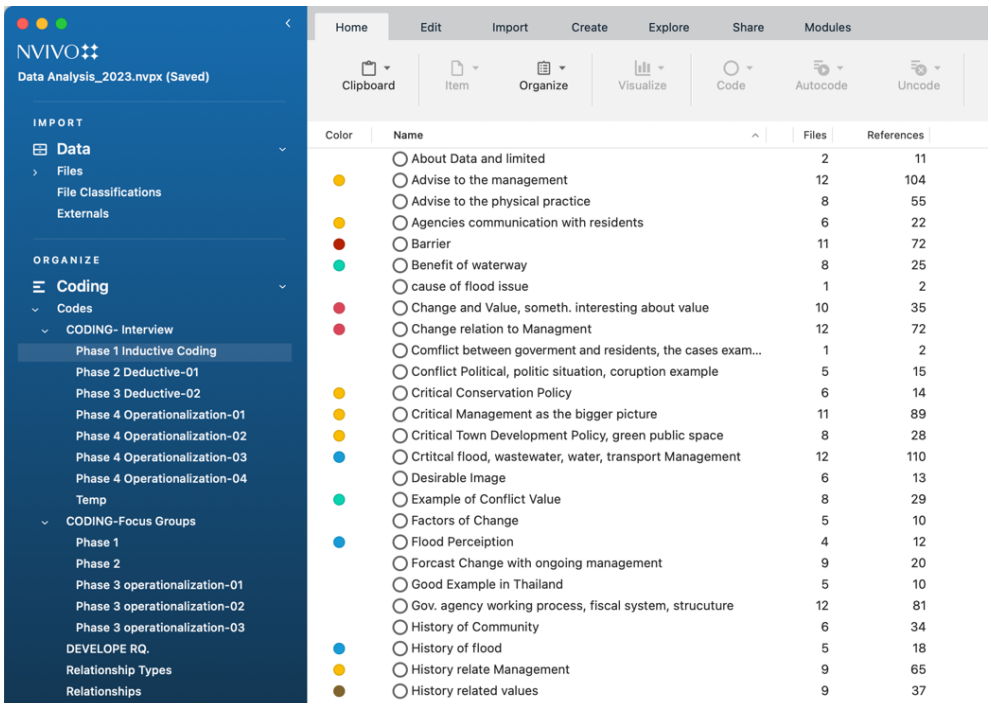


Fig 3-20 List of codes with their files and reference numbers, created during the inductive or open-coding

3) Deductive coding

In this stage of the employed methodology, the researcher systematically amalgamated comparable codes and introduced additional pertinent codes throughout the files. The indication that a code had a limited number of references suggested a potential need for merging with other codes, signifying its possible lack of significance. Conversely, a high reference count for codes signalled the necessity of incorporating more codes, as the data within those codes encompassed diverse interpretations or meanings. This iterative process consequently required the incorporation of more codes or components within the analytical framework (Meehan, 2021).

Following this process, themes and sub-themes were formulated by grouping together the multitude of codes. Significantly, this stage meticulously aligned the clustering of codes with the research questions or objectives, thus adopting a deductive approach. The consideration of knowledge or components in accordance with each research objective was a key aspect of this stage. The deductive coding process involved the systematic development and review of themes, aligning them with the components of the research (Thompson, 2022). This structured and systematic coding approach facilitated the restructuring of codes and themes based on emerging data (UOA, 2019). Consequently, this coding process led to the augmentation or integration of codes with others.

The examination of the dialogue in Example A through inductive coding initially categorised it as “agency communication with residents.” During this deductive phase, it was merged with other codes, prompted by compelling research pertaining to resident involvement within the decision-making process concerning BUW. Consequently, it was renamed as “meaning in residents' engagement.”

In the inductive coding process, Example B, originally labelled as “History of community,” was redefined as “Livelihood”. This adjustment was prompted by a research-specific interest in understanding the value stemming from BUW. The dialogue in Example B, pertaining to the settlement along the waterway, delved into the benefits for the community and the economic advantages tied to crafting occupations.

4) Operationalisation

When the earlier stage reached saturation points, indicating a repetition of processes and no emergence of a new data (Meehan, 2021), or when the data had been thoroughly examined through multiple rounds of abductive techniques (combining inductive and deductive coding), this systematic alignment or operationalisation between themes and RQ began rigorously.

The researcher systematically reviewed, reorganised, and refined the existing codes and themes to effectively align with each research objective. Returning to the RQ, the researcher identified the most explicit queries from which themes could be derived, assessing whether the data coherently addressed them. During this phase, the researcher systematically elaborated on each sub-RQ independently, investing time and engaging in iterative processes. The process included continuous refinement until the data became coherent or comprehensive enough to elucidate the response to the RQ. In instances where numerous

codes were present within the primary theme, the researcher structured them into clusters and formulated sub-themes to facilitate a more manageable analysis of the data, preventing overwhelm.

Example A' s dialogue of "agency communication with residents" underwent a renaming to "meaning in residents' engagement" and was amalgamated with other codes to form the theme titled 'Performance of BUW governance' in this operationalisation stage. This theme was invoked to address RQ 1 on how the governance system influences the landscape change of BUW. Example B, subsequently, was grouped under the overarching theme called 'BUW value' to address RQ 2 (Fig 3-21).

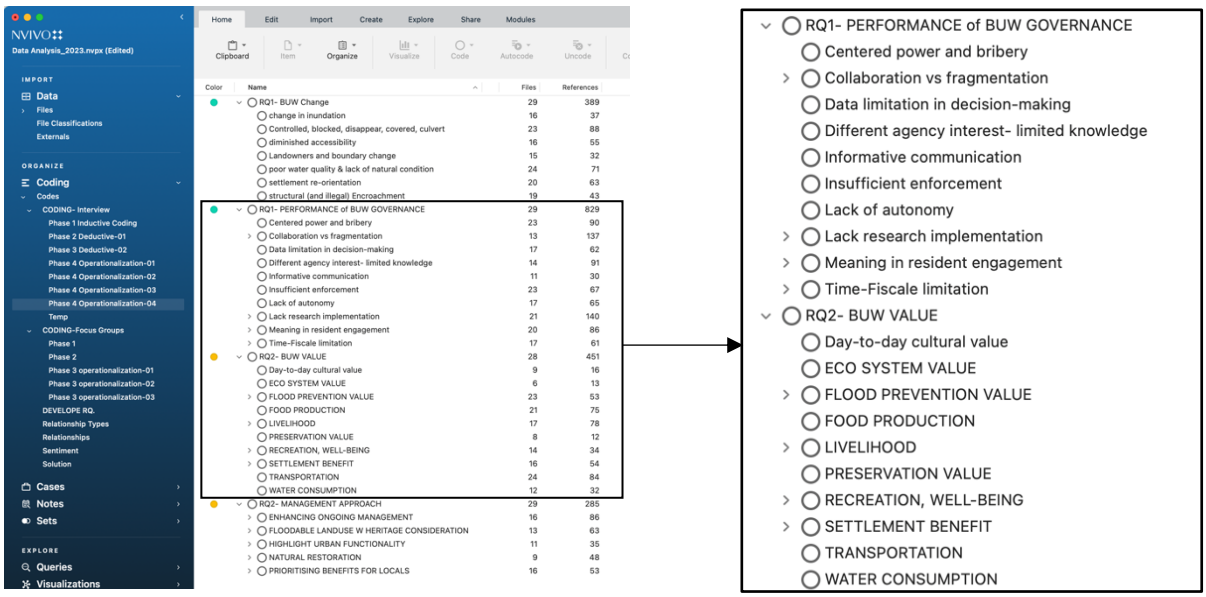


Fig 3-21 Example coding of theme 'performance of BUW governance' and 'BUW value'

5) Data presentation or display

In the ultimate phase, the process entailed a thorough comparison of the data presentation or display to discern appropriate conclusions for inclusion in the findings chapter. During this conclusive stage, the researcher revisited the original dialogue from the transcripts to safeguard the preservation of the data's intended meaning (Braun and Clarke, 2020).

Each theme corresponding to its respective research question underwent comprehensive exploration through diverse data presentations before determining the appropriate format for inclusion in the findings chapter. Data visualisation was generated using Nvivo's "explore query" function (Meehan, 2021). The primary objective of presenting the data was to facilitate comparison, systematically cross-referencing themes and codes of the cases with attributes or classifications derived at the study's inception. Furthermore, comparisons were conducted with other pertinent themes or codes to observe variations in results when addressing the research questions.

Example C

The Nvivo tool's "crosstab queries" feature was utilised to compare codes within the overarching theme "BUW value" with the chosen cases or attributes, specifically focusing on different stakeholders. The resulting table, Fig 3-22, shows different quantities for each code, which are compared across stakeholder types based on data classification. This data display illustrates how different stakeholders have varying levels of references to the landscape value of BUW.

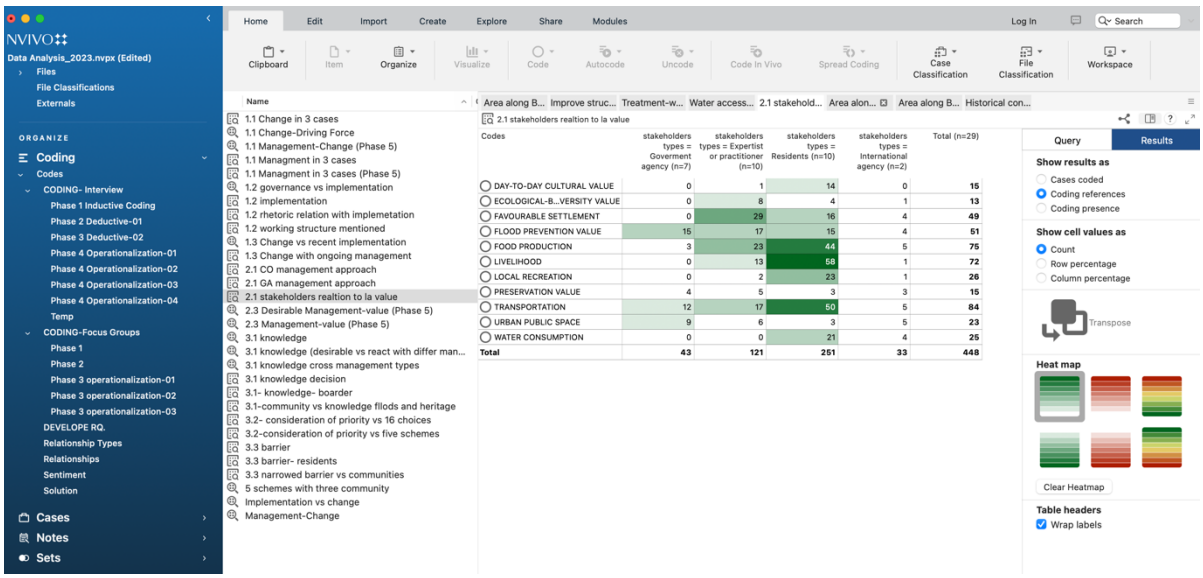


Fig 3-22 The tool utilised "explore queries" from "crosstab" of the selected theme: BUW's value, and selected cases: stakeholders.

This qualitative analysis did not focus on quantities or numerical values. Instead, the primary interest lay in presenting the data for comparison. Consequently, the findings exclusively highlighted the differences and similarities in the data, emphasising the relationships between the data points. This was achieved by removing numerical values from the table and utilising colours to represent the findings.

3.7 Building materials

The materials for the study were developed using analysed data from the semi-structured interviews to create toolkits for the focus group activities. Visual illustrations were created from hand sketches to explore potential changes in specific locations using the interviewee's data. The study processed the thematic analysis of the interview data until clear themes emerged in response to the RQ, which focused on "landscape change and management approach". This theme, therefore, included sub-themes and codes derived from the clustering of the data through the above TA process. As a result, the materials illustrated the differentiation of landscape change and management approaches, for which the researcher employed two forms of hand-sketching: 1) small graphic cards and 2) diagram sections.

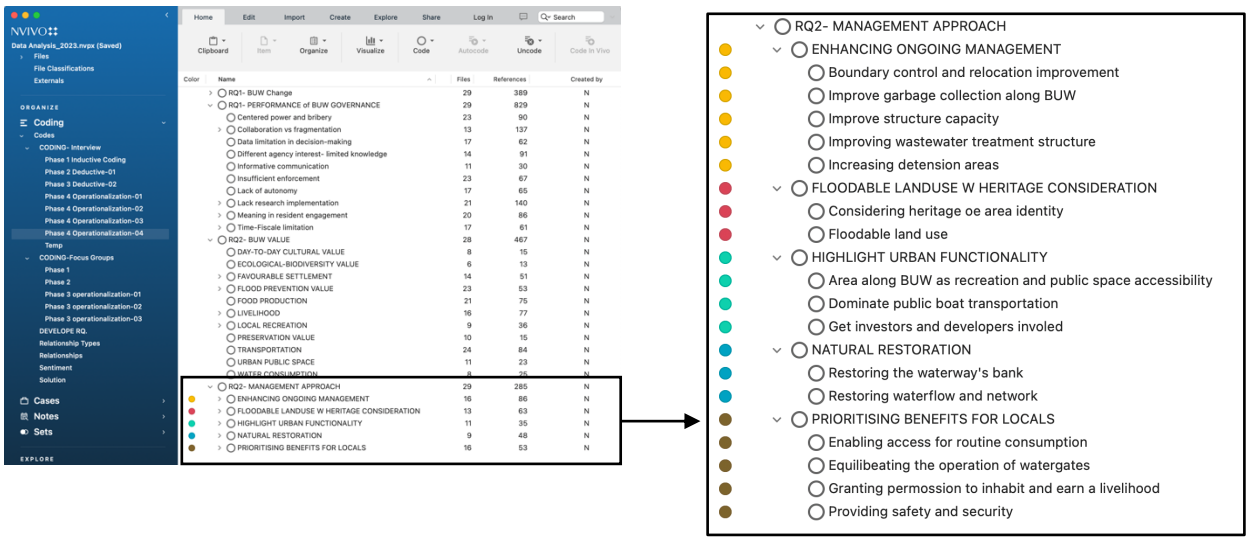


Fig 3-23 The developed themes with the selected theme "management approach"

According to Fig 3-23, which shows the chosen theme named "management approach", the study used this theme as the major data to construct the materials for the cards and section diagrams. At the same time, this theme attempted to answer RQ2 on BUW's management. Comprehensive details are provided in Section 5.4 Chapter 5.

1. The small graphic card (schemes)

The schemes were drawn from the findings of the 16 codes under the theme "management approach". These codes were translated into 16 cards with hand-drawn visuals representing various schemes for BUW alteration, such as improving garbage collection along BUW, recovering the banks of BUW, etc. (Fig 3-24). The researcher created graphic images and incorporated keywords mentioned in each card for use during the focus group sessions.

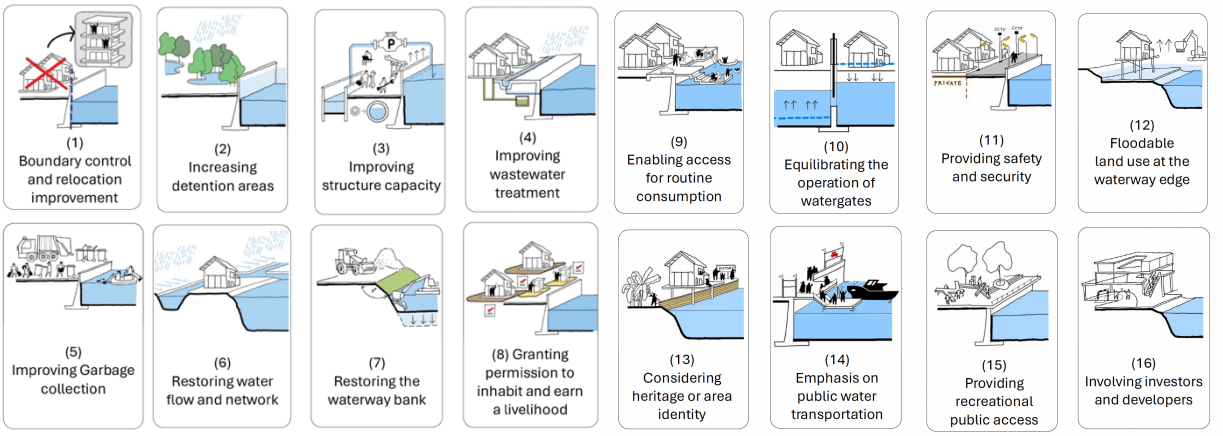


Fig 3-24 The 16 small cards of the 16 BUW's alteration schemes (see the comprehensive detail in Section 5.4 Chapter 5 and Appendix 3D)

2. The diagram sections (scenarios)

Diagram sections illustrating landscape change approaches were created from the five sub-themes within the selected theme, "management approach". These section diagrams were sketched to depict the actual placement of BUW and community areas, designed to be graphical and easily understandable by including concise sentences explaining each section. As a result, the collection of sections included four sets in total: one set depicting BUW at the city scale and the other three sets representing the three study sites (Fig 3-25). Each set contained five different sections, each representing a different sub-theme derived from the analysis process.

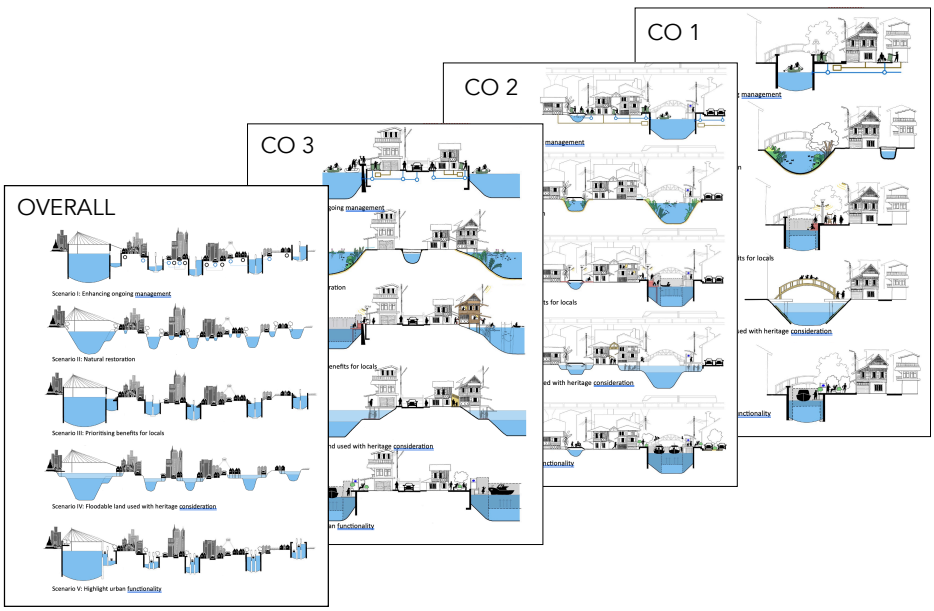


Fig 3-25 Four sets of diagram sections, five sections to each set (see the comprehensive detail in Section 5.4 Chapter 5 and Appendix 3E)

3.8 Research ethics and integrity

The meticulous consideration of ethical principles in this research project aligns with the stringent standards set forth by the Department of Landscape Architecture Research Ethics Committee at the University of Sheffield. Approval for the empirical research phase of this thesis was granted in September 2021, underscoring the project's commitment to ethical rigour.

An integral facet of the ethical evaluation involved thoughtfully orchestrating the recruitment of participants and interviewees, all of whom were conducted in Bangkok, Thailand. This was achieved through a multifaceted approach, employing public advertisements on community boards, shared social blogs, and posters for recruiting residents. The intent was to actively involve residents and provide them with the opportunity to initiate contact with the researcher. The recruitment process of the institutions was also planned to be conducted with formality and caution.

Within this process, safeguarding the personal information of interviewees and participants, both institutions and residents, emerged as a paramount task, necessitating thorough consideration and unwavering commitment.

The preparation of consent forms and participation information sheets assumed a central role, serving as essential instruments that significantly facilitated the fieldwork. Given the COVID-19 situation, rigorously planning aligned with Thai governmental advice, especially for the workshop activities. For example, materials were distributed individually. Moreover, the researcher ensured that the information provided to participants and interviewees was accurate, encouraging an open avenue for inquiries before commencing the research process.

In a strategic move to prioritise the researcher’s personal safety, all data collection was conducted in public spaces or specified locations at the home university in Bangkok or participants' workplaces. A comprehensive risk assessment was executed to anticipate potential challenges, especially those stemming from the ongoing pandemic. Considerations included aspects of (e.g.) vaccination status and the feasibility of conducting interviews online, reflecting the research's commitment to adaptability and participant well-being.

3.9 Reflection on field work

Reflecting on interviewees and participation recruitment

During the fieldwork in the potential communities, the riverside community (identified in the second stage of site selection) expressed discomfort with the prospect of participating in the research. Positioned prominently along the river in a conservation area, this community maintains a strong sense of privacy, making it challenging for outsiders to approach. Despite following ethical procedures and seeking permission from the community leader, there was no response from the community. Consequently, recruits were gathered from the adjacent Banpantom community, which shares a similar setting and was originally included in the list of potential sites. Although Banpantom is not as close to the river as other potential communities, residents offered valuable insights into the river context, given the historical setting's resemblance that of the riverside neighborhood. The community is adjacent to where waterways interconnect and is in close proximity to the mouth of the river.

In the recruitment process for government agencies (GA), the researcher encountered complex and time-consuming procedures. Formal requests were submitted through official letters to the general directors, with certain departments, including the Town Planning Department, requiring hard copies, aligning with the prevalent top-down operational approaches in Thai government agencies. This process involved waiting for consideration, and as the letters progressed through various offices within the agency, the researcher faced challenges in tracking and retrieving them.

Out of eleven targeted GA, four declined to participate in interviews. The Transportation Department and the Marine Department were unreachable for consideration, while the Environmental Department and the Office of National Water Resource (ONWR) cited unavailability and declined interview requests, with ONRW providing policy documents instead. The Environmental Department and the Town Planning Department required a protracted appointment process, but the researcher faced obstacles in obtaining an interview with the designated office inside the Environmental Department, hindering the interaction.

Two practitioners from relevant positions were not interviewed. An international landscape architect with extensive experience in government and Southeast Asian collaborations engaged in informal discussions, but formal interviews were hindered by a busy schedule. The Urban Design and Development Centre (UDDC), a research institute collaborating with government organisations, did not respond to emails or calls initially, only engaging after data analysis commenced. Subsequently, they were enlisted for the second phase of data collection.

In the recruitment plan for the focus group, the researcher aimed for an ideal participant mix, encompassing government agencies, academics, and practitioners to ensure diverse stakeholder representation. However, securing admission and coordinating suitable timings for participants with varying positions and expertise posed considerable challenges. Consequently, participants within different stakeholder groups, such as academics, exhibited comparable positionality. Despite this challenge, these participants, possessing diverse knowledge from the two primary areas of expertise, namely waterbody and place-making, met the criteria outlined in the research purpose, contributing valuable insights.

Reflecting on the interviews

The interview conducted with the GA was notably formal, taking place in office settings, and the time allocated to the researcher was limited. Interviewees from the GA were delegated by their superiors or directors, presenting some documents during the interview that couldn't be shared due to their unpublished or ongoing procedural nature.

A UN Habitat stakeholder provided substantial insights during the interview, but their participation was constrained to 30 out of the 60 minutes scheduled with the researcher. Conversely, interviews with locals proceeded smoothly, with three interviewees instead of four in two of the three communities due to redundant data. In CO-01 and CO-02, locals expressed more interest in architectural buildings, diverting attention from the waterway's dimension. Consequently, these interviews required additional structuring to maintain focus.

Challenges in accessing transparent data

The challenge arose from the inherent difficulty in obtaining information or data from governmental sources. For instance, the researcher sought elevation or Digital Elevation Model (DEM) data for Bangkok, only to discover through this thesis's findings that such information does not exist. Numerous research studies conducted by educational institutions for government projects, including the Minburi Project, were not publicly published. In the case of the Minburi Project, the researcher acquired information from project consultants rather than official publications, as these projects were not intended for public dissemination.

Furthermore, accessing information within government agencies posed additional challenges. For example, the historical canal in Thonburi redevelopment project proposal by TPD was off-limits to the researcher, who was denied permission to access the proposal. The reason given was that their leaders had not authorised the release of information to external parties. This lack of transparency and restricted access to government information emerged as a significant challenge in conducting the research.

Reflecting on site surveys and taking photographs

A community named 'Bann Kruo,' residing along the Sanseab canal, posed limitations on the researcher's ability to photograph the waterway. This reluctance stemmed from their prolonged engagement in a government motorway development dispute since 1990, which targeted their temple and graveyard for demolition. Although the residents successfully won their legal battle, they remained cautious and protective of their community. Initially uneasy about the researcher's presence, residents eventually permitted the examination of waterways within their neighbourhood upon realising that the photo locations were not on their private property.

Two out of the eleven selected sites could not be surveyed. A visit to the Phrakanong Canal between March and June 2022 was hindered as boat transit was cancelled. Local inquiries revealed that the cancellation was due to the ongoing pandemic, with the expensive cost of oil engines preventing the reinstatement of this transit route. The other site, Bang Pratun canal in the western area, was inaccessible due to an unwelcome intruder and barking dogs blocking the entrance of a small, unofficial alley serving as the access street. Despite the

presence of a public learning center, the area had become less populated and barren following a lockdown prompted by the outbreak.

Reflections on the focus group/workshop conducted

The workshop implementation encountered notable hurdles in facilitating open discussions among participants with diverse backgrounds and expertise. Despite employing strategies like individual tasks to break the ice, not all eight groups generated collaborative findings. One group abstained from participating, while another group's participants presented individual opinions directly to the facilitator/researcher, bypassing group discussions.

Drawing insights from the literature, the study delves into the cultural challenges within the decision-making process, citing examples from China and the Western context. The comparison highlights cultural nuances, such as Westerners freely initiating discussions with questions, while Chinese individuals tend to be reserved until they grasp the information comprehensively (Choo, 2002). This aligns with Thai culture, as evidenced in the research's methodology.

Furthermore, the workshop's dynamics were influenced by the personality and age of participants. The researcher's positionality also played a role in recruiting interviewees and participants, as discussed earlier on. During focus groups, the workshop activities were also influenced by the researcher's position, exemplified by incidents where senior participants deviated from set activities to discuss the reasons behind them or showed greater interest in the thesis's proposal and objectives. This dynamic stemmed from the researcher's perceived youth and relative inexperience, occasionally being viewed as a student seeking suggestions.

Despite the challenges faced in accessing data and conducting the workshops, the methodology involving working groups or open-discussion activities was positive and remains an important part of research into decision-making.

The next chapter will outline the context of a case study of Bangkok waterways and three communities.

Chapter 4 The case study context

4.1 Introduction

This chapter provides a comprehensive overview of the waterway system in Bangkok, highlighting its historical development, management challenges, and the three study sites that form the basis of this researcher's study. The chapter calls on desk work through policy analysis, historical maps and document reviews, academic and grey literature, and data from interviews. Section 4.2 describes Bangkok's governance structure in relation to waterway management. Sections 4.3 and 4.4 explore waterway management concerning heritage and flood management, respectively. Section 4.5 explores the history of Bangkok, specifically early settlement (1470-1767) and the 'water city' era (1782-1866). Section 4.6 continues to describe the transformation of the waterway during the city's development (1860-1940s) and urbanisation periods (1950-2020s). The second part of the chapter focuses on the study sites: Banpantom (Section 4.7), Minburi Upatum (Section 4.8), and Talad Nongchok (Section 4.9), describing their waterway relations chronologically.

4.2 Management structures concerning waterways

Thailand operates as a democratic constitutional monarchy since 1932. The Thai government consists of three branches: the executive, the legislative, and the judiciary. In the executive branch, a cabinet led by the Prime Minister oversees twenty ministries designated by the central administration. These ministries manage various national government departments, state enterprises, and public organisations (Fig 4-1). Bangkok (and Pattaya) falls under local administration, while the other 74 Thai provinces are under provincial administration (PA) where the mayors are leaders (UCLG and OECD, 2016). Within the judiciary, entities such as the Office of the National Anti-Corruption Commission (NACC) and the State Audit Office of the Kingdom of Thailand (SAO) are responsible for investigating projects conducted with questionable processes and outcomes (EP-05), including those in BUW.

The Decentralization Act (1999) in Thailand was established to promote local governance and empower local authorities. The Act aims to transfer certain powers, responsibilities, and resources from the central government to local administrative organisations. It has greatly influenced the management of residential areas by introducing a process of community participation (Jonanan, 2000, Webster and Maneepong, 2009). Yet, the implementation of this Act has faced hurdles and remains incomplete regarding the transfer of administrative, fiscal, and political responsibilities from the central government to local governments (Marks and Lebel, 2016), as discussed in Section 2.4.2 Chapter 2.

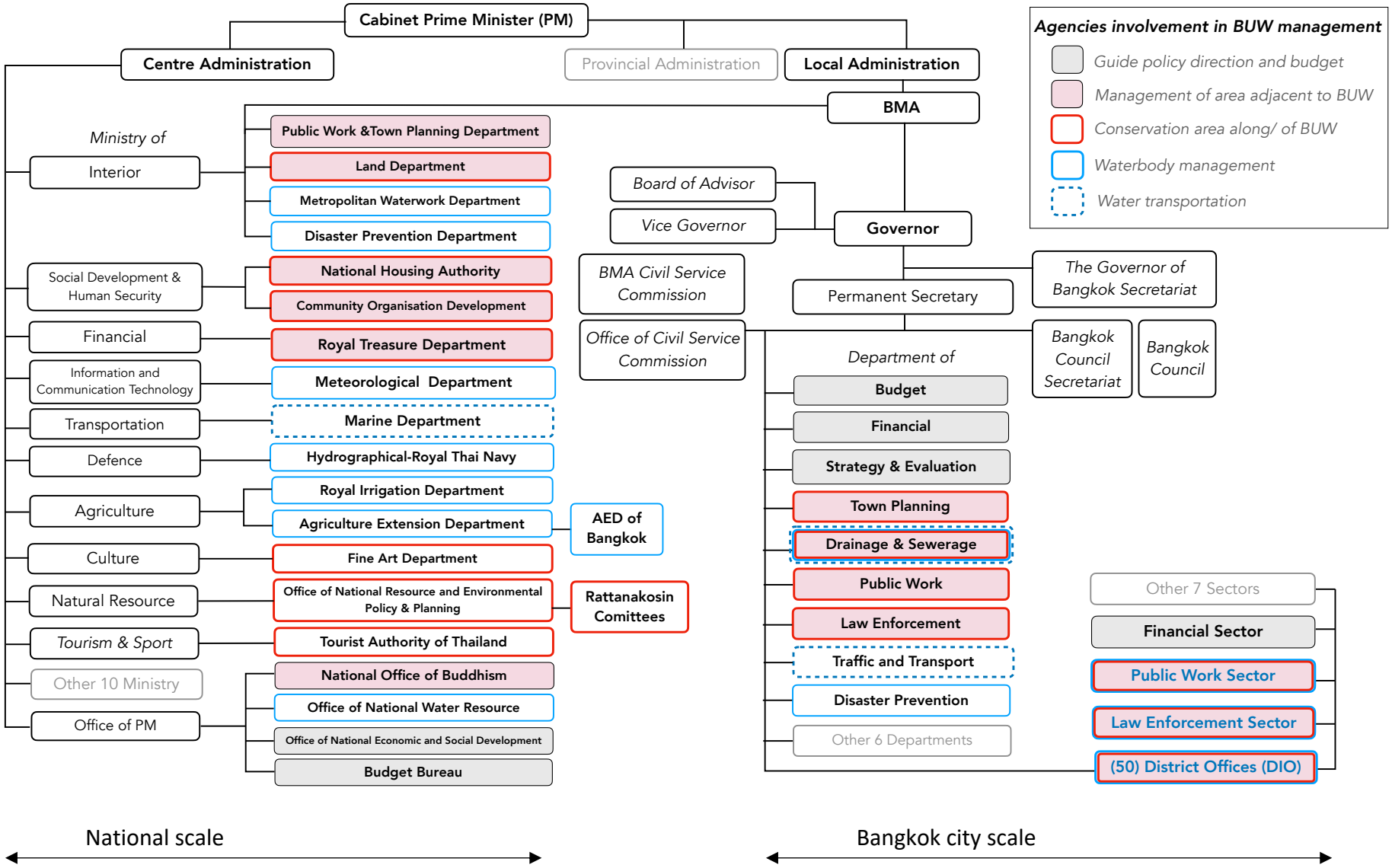


Fig 4-1 The (executive branch) structure concerning the management of Bangkok's waterways and their surrounding areas

Central Administration

National agencies concerning BUW waterbody management (Fig 4-1) include the Royal Irrigation Department (RID), which oversees irrigation waterways, the Agricultural Extension Department (AED), managing agricultural production related to irrigation channels in Bangkok's outskirts, the Marine Department (MAD), handling water transportation, and the Meteorological Department (MED) and Hydrographical Royal Thai Navy (RTN), which measure rainfall and water levels in the Chao Phraya River. The Disaster Prevention Department (DPD) addresses flooding incidents, and the Metropolitan Waterworks Department (MWD) oversees the Khlong Phrapa waterway, supplying water for use in Bangkok (EP-05/GA-03/04).

Established in 2017, the Office of National Water Resource (ONWR) is a special national government agency which coordinates water agencies across different ministries. The ONWR has published the 20-year national water resource management plan (2018-2028) (Section 4.4) as a guideline for city-scale water management (ONWR, 2021).

Concerning area management along BUW (Fig 4-1) on a national scale, the Public Works Town and Planning Department (PWTPD) monitors Bangkok's town plan. The Community Organisation Development Institute (CODI) and the National Housing Authority (NHA) are responsible for residential areas, proposing relocations for encroached areas or enhancing existing legal residential zones, including those along the waterways. The Royal Treasure Department (RTD) and the National Office of Buddhism (NOB) own many areas along BUW. The Land Department (LAD) manages and administers leases, including those along BUW (EP-01/05/GA-02/06).

Turning to conservation area management, the Fine Art Department (FAD) is responsible for protected or conserved monuments, including those in the conservation zone in Bangkok, known as the Old Town, or Rattanakosin, under the Ancient Monument Act of 1961. The historical canals were registered as protected elements in 1976. The regulation monitors any changes to the historical canals and the river (GA-07). The Rattanakosin Committee (RC), established in 1982, was recently placed under the Office of National Policy and Planning (ONEP). The RC-ONEP's tasks included policy creation, conservation plans, creating guidelines for infrastructure and services, and responsibility for monitoring any projects occurring in Bangkok's ancient town or the conservation zone (ONEP, 1994, ONEP, 2017a). The ONEP monitors the Environment Impact Assessment (EIA). The Tourist Authority of Thailand (TAT) enhances the role of Old Town Bangkok and its historical waterways in supporting tourist attractions (EP-05) (Fig 4-1).

The Office of National Economic and Social Development (NESDA) produces national plans known as NESDP, serving as the primary guide for all policy directions, including those implemented in BUW. Budget decisions and control rest with the Budget Bureau (BUB) (EP-01/05).

Local Administration/ BMA

The Bangkok Metropolitan Administration (BMA) adheres to the BMA Act of 1985, which remains in effect. The Act designates BMA as the governing body for local administration,

directed by the Ministry of Interior (MOI), and the Governor is an elected official (Jonanan, 2000). Bangkok's governance consists of the executive branch led by the Governor and the legislative branch, the Bangkok Metropolitan Council. The Governor and administration team handle policy, supervision, and control, while the Council represents the population, overseeing city administration tasks (Punyaratabandhu, 1985, Sevilla, 2012).

There are fifteen departments under BMA, each with distinct responsibilities within its designated jurisdiction (Jonanan, 2000, Punyaratabandhu, 1985). Six of these departments are involved in BUW management. For areas located along BUW, the Town Planning Department (TPD) oversees the city's development by creating comprehensive plans, while the Public Works Department (PWD) implements these plans on-site. The Law Enforcement Department (LED) maintains order, addressing issues like illegal street vendor occupation along BUW (GA-02/05). Regarding water bodies, the Drainage and Sewage Department (DSD) ensures water quality, solid refuse collection, and flood protection (DSD, 2007). Flood incidents are managed by the Disaster Prevention Department (DPD). Transportation, including waterway routes, falls under the jurisdiction of the Traffic and Transport Department (TTD). The Strategic and Evaluation Department (SED), Budget Department (BUD), and Financial Department (FID) handle policy guidelines, budget decisions, and financial control, respectively (GA-04/EP-04/05).

Each of the 50 districts in Bangkok is overseen through District Offices (DIO) (Sevilla, 2012), with each district consisting of seven sectors (RE-01/05/08). The DIO operates as a small branch comprising staff from various departments. DIO staff must report to their respective departments for assistance (GA-02/04). Three of these sectors, namely the law enforcement sector, public work sector, and financial sector, are directly involved in managing relations with the waterways (RE-01/05/08). The resources and staff of its 50 districts have been agreed to be ordered by the BMA leadership or Governor (Jonanan, 2000, Suwanwijit, 2014). The DIO is not empowered to allocate budgets independently and must rely on funding from the BMA (GA-04/EP-05).

There are two primary pathways through which projects are implemented. The first path involves departments initiating action projects based on their own policies or selecting projects from other departments' existing policies. For instance, the DSD might adopt a project from the TPD to align with its drainage objectives, or the PWD might opt to execute a policy from the RC-ONEP for a location within a conservation zone, subsequently seeking budget approval from the BUD by referencing the relevant policies (GA-02/06/07/EP-03).

Generally, Projects involving complex land ownership issues can take 4-5 years to proceed, compared to regular research projects with conceptual designs, which usually take 1-2 years. Projects considered for implementation demand an additional nine months for revisions, construction drawings, cost estimates, and budget requests within the same fiscal year (GA-06/07). The process is tied to the Terms of Reference (TOR), which the agencies themselves formulate, including the scope of work, timeframe, the involvement of experts, etc. This TOR plays the significance role in guiding agency work (GA-01/02/04/07).

Departments can request funds from the BUD to carry out their projects. Each department also manages its own separate annual budgets allocated for routine tasks, such as waterway

dredging and staff salaries. Budgets must be requested and utilised within the same fiscal year, which runs from September to August. Normally, urgent projects initiated by the Governor are given priority. Additionally, there is often a queue for budget requests from the BUD, reducing the likelihood of accommodating new project requests (GA-04/06).

The second pathway involves the Bangkok Governor independently deciding on non-routine projects proposed by departments, including budget approval. Projects may also originate from the Governor's interests, unrelated to existing departmental policies. Appointed departments, such as the Urban Development and Renewal Office (URD) of TPD, manage implementation and communicate with the DIO. Examples include projects related to BUW, such as the Chong Non-Cee Canal (GA-04/06) (Appendix 2C).

Regarding wastewater management in BUW, regulations have mandated separate wastewater systems for commercial, industrial, and household use since 1995. The first water treatment facility in the central business district started operations in 1994, treating wastewater before releasing it into waterways. By 2014, eight treatment plants covered the inner city, managed by the DSD. Four additional plants have been proposed (DSD, 2017). However, the majority of Bangkok still lacks coverage by treatment plants (Fig 4-2) (GA-04).

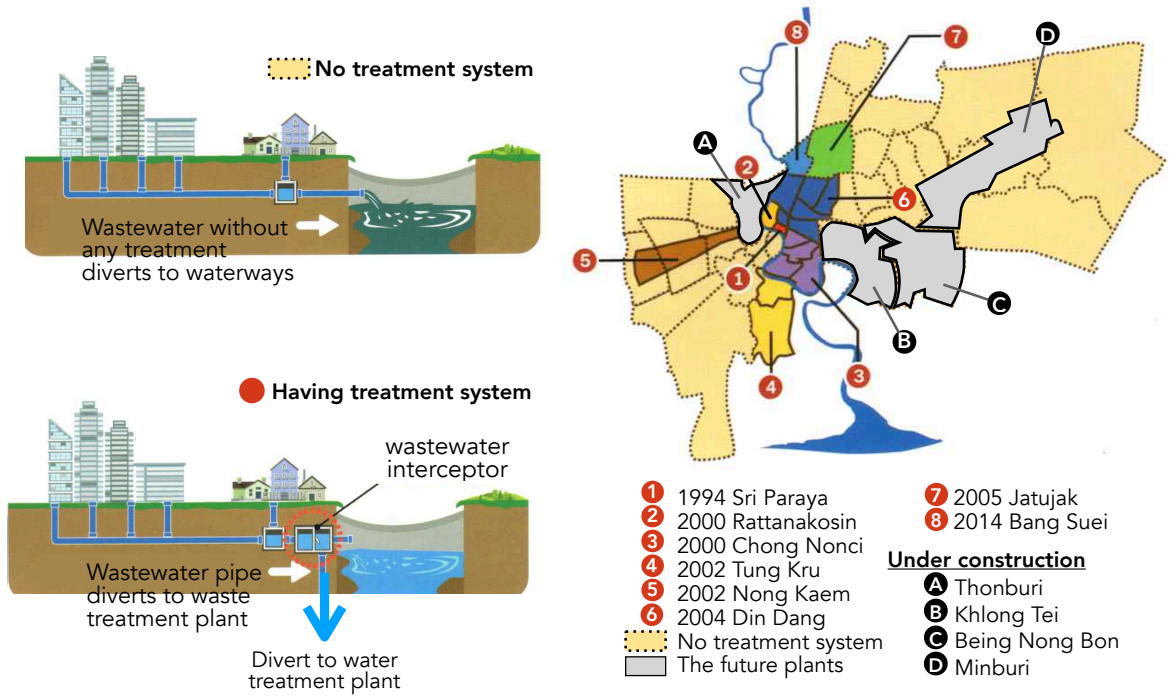


Fig 4-2 The water treatment plants in Bangkok, adapted and translated to English from https://webportal.bangkok.go.th/minburi/page/sub/3079/55/3/info/196652/ accessed August 2023

Bangkok's water transportation in BUW, primarily managed by MAD, includes the Chao Phraya Express Boat Company operating a public transit system since 2004. Private investors offer tourist routes, with FAD overseeing conservation area construction of piers (GA-07). As of 2020, there are two canal routes by private sectors: the original Sanseab Canal initiated by Governor Pijid Rattakul in 1990 (18 km), and an extended route (11 km) aimed at easing road

traffic. The Padungkrung Kaseam Canal, launched in 2021, offers free electric boat rides along a 5 km stretch, supporting TPD's redevelopment (BMA, 2019).

Many other routes have faced suspensions due to factors such as low user numbers, high oil prices, and watergate obstructions. For example, the Pasi Chareon Canal project (2016-2020), aimed at easing road traffic, was suspended in January 2020. The Bangkok Yai Canal's 2019 trial, part of the **Road Rail Boat by DSD**, was halted due to watergate operations. The Phrakanong Canal was suspended post-pandemic, and the Rungsit Canal never saw operations (GA-02/06/07). Future routes in the 2020s comprehensive plan (draft) by TPD include Pream, Ladprao, and Phraweat Canals, aimed at supporting mass transit, redevelopment, and tourism, respectively (TPD, 2019) (Fig 4-3).

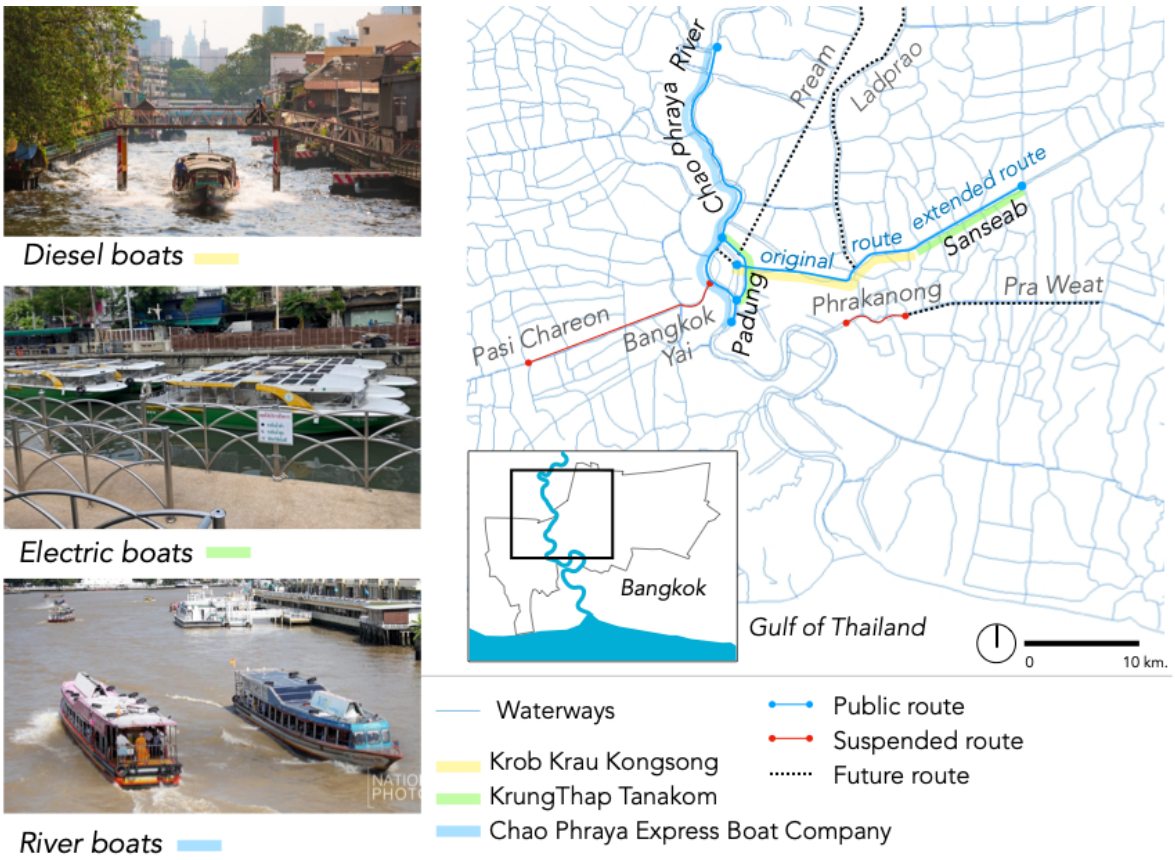


Fig 4-3 The water transportation in BUW

4.3 Waterways and conservation policies

Bangkok's conservation plan, namely The Old Town Plan or Rattanakosin Plan, was first established in 1982 following the implementation of several conservation projects between 1970-1978. Amid significant changes to the city's structure due to modernisation and urbanisation (Section 4.6), the plan initiated by the Rattanakosin Committee aimed to promote national pride and international reputation while conserving historical monuments. The projects were designed to protect royal palaces, religious sites, and historical monuments (ONEP, 1994) by re-ordering areas, including those along the historical waterways (Appendix 2B). However, less than 40% of the projects were implemented (Issarathumnoon, 2006).

The plan was revised in 1994 (Issarathumnoon, 2006) and split proposed projects in the conservation zone into four groups, including the groups of water and street transit (Fig 4-4 Group 2). This group aimed to develop areas along the historical canals and focused on transportation, particularly walkways along the historical canals (ONEP, 1994). This objective influenced later dams, roadways, and embankment construction along the historical waterways (Fig 4-5).

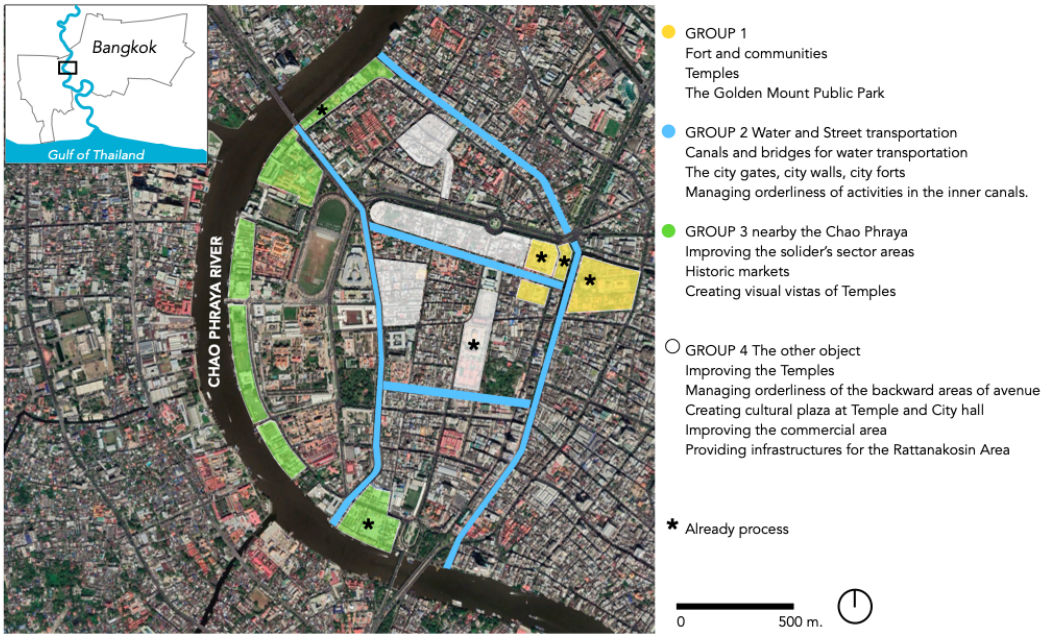


Fig 4-4 The groups of eastern conservation projects from Conservation Masterplan 1994, adapted from (Issarathumnoon, 2006)

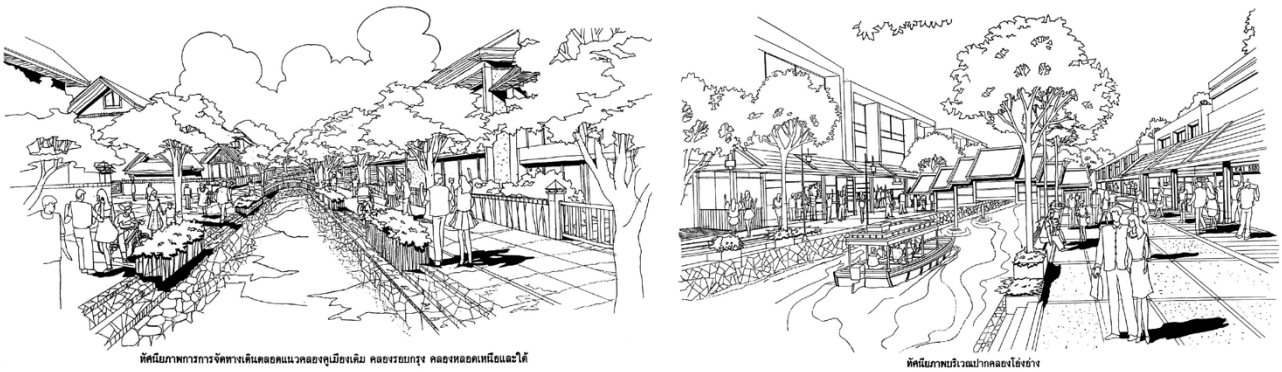


Fig 4-5 Perspectives showing the walkway proposed along the historical canals: Ku Meang Derm Canal, Rob Krung Canal, and North-South Lod Canal (Left), and Ong Ang Canal (Right) (ONEP, 1994)

Twenty landscaping and scenic enhancement projects were approved, but a number of residences and store premises deemed “unimportant” were to be demolished. Because the majority of the region was once residential, social controversy became a significant issue (Issarathumnoon, 2006, Issarathumnoon, 2020). Clashes between the government and

communities occurred due to the approach taken by the plans (Sirisrisak and Akagawa, 2012, Wongtimarat, 2013), as discussed in Section 2.4.4 Chapter 2.

This 1994 plan was later presented at a public hearing in 1995, and a revised version was approved in 1997 (Fig 4-4), followed by the Decentralisation Act of 1999 (ONEP, 2017a, TPD, 2020a, TPD, 2019). As a result, conservation projects employed several methods to persuade people to join the consultation process. The number of buildings and local communities proposed for demolition under the 1997 revision plan was reduced (Issarathumnoon, 2006, Issarathumnoon, 2020). However, instances of local exclusion persisted, such as the relocation of a traditional community along a historical waterway (Fig 4-6), as discussed in Section 2.4.4.



Fig 4-6 The Mahakart Fort: the terrace of the residential area (Left), the green space with the fence along the canal(Right)
Source: https://themomentum.co/momentum-feature-the-conflict-and-solutions accessed July 2022

The Rattanakosin Plan was recently redeveloped (2017-2020) to address urban growth, including mass public transport projected to pass through the conservation area. The key change in this plan is the expansion of the conservation zone's boundary to restrict future growth in this heritage region (EP-03/IA-08) (Fig 4-7). This latest policy places greater emphasis on intangible components, such as traditional activities and food culture (Page 6-77: ONEP, 2017). It focuses on development guidelines rather than specific changes in the landscape area (EP-03).

The traditional communities within this recent policy are more highly valued than in the old version. While the old policy had three objectives: enhancing parks and recreation, monument conservation, and land use adjustment (ONEP, 1994), the recent objectives in 2020's policy discourse include: "(7) preservation and redevelopment of the physical and community's way of life" (Page 1-5: ONEP, 2017a). The local scale is also discussed as the dimension that needs to be balanced with the town scale as same as the balancing development and preservation (Page 2-2: ONEP, 2017a). However, the historical waterways are not embedded in their local perspective (EP-03). Small-scale projects, such as pathway

renovation and traffic control, are proposed. The participation process is emphasised by holding nine public hearings and six focus groups (GA-05/EP-03).

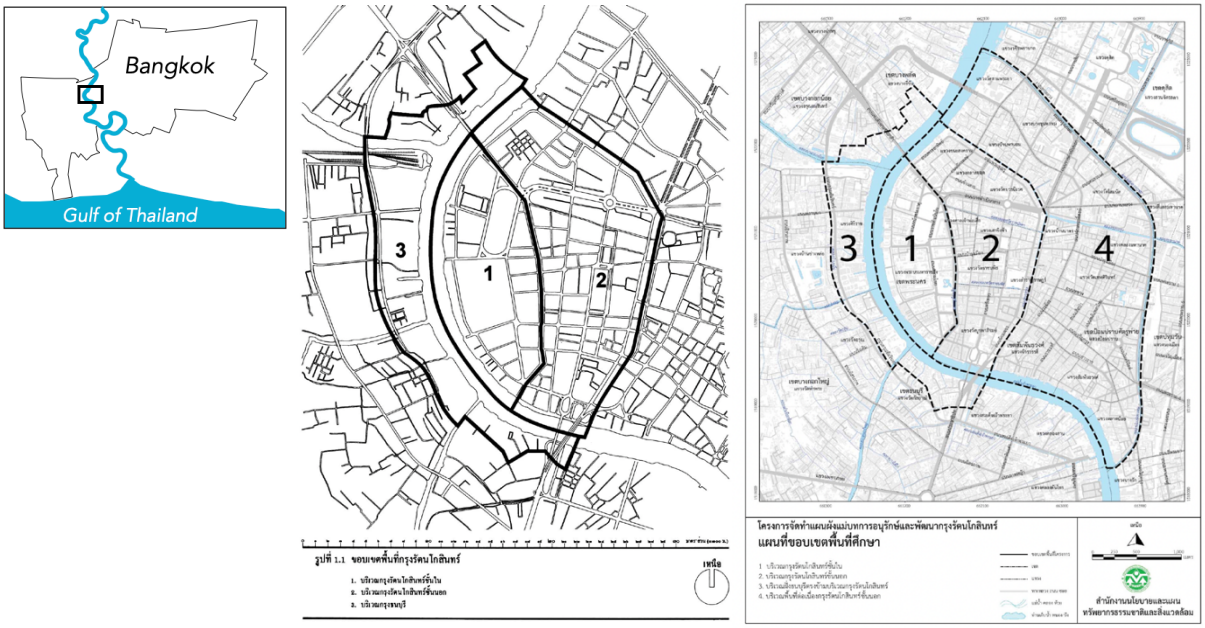


Fig 4-7 The conservation zone of Bangkok (1982, 1994, 1997's plans) (ONEP, 1994) (Left) The extended conservation area now includes four zones (ONEP, 2017a) (Right)

Records of residents' comments on the structure construction along the waterway were noted in this new plan (2017-2020) as part of the participation process (Appendix 2A-1) (ONEP, 2017b). However, there is no evidence to indicate that the feedback provided by the locals has been incorporated or utilised (EP-03). Regarding water management, the 2020 policy still clearly presents the conservation zone as a highly protected area and emphasises improving water treatment in the area (ONEP, 2017a).

Because the waterways in the conservation zone have been implemented directly by the BMA as the owner of the area, the BMA has introduced its own plans separate from the ONEP's policy (EP-03/IA-08). For example, the Khlong Rob Krung Redevelopment Project by TPD, which aims to renovate the area along the historical canal (TPD, 2017) (Section 4.7, Appendix 2B-2/2H-2). Other projects include the BMA's heritage district redevelopment project (2015) to commemorate Bangkok's 250th anniversary (UDDC, 2015) (Appendix 2B-3) and the Padungkrungkaseam Canal Project appointed by the Governor (Appendix 2C-3).

4.4 Waterways and flood prevention policies

The main objective of flood management for the upper Chao Phraya delta is to protect the cultivation area and residential area (GA-03/04), while the DSD mainly works to protect the urban areas of Bangkok City (DSD, 2007-2011). The Royal dike or flood barrier (Fig 4-8) was constructed in 1985 following the pattern of elevated roads after the 1983 floods. The dike spans 72 km and is located in Eastern Bangkok. This structure was originally conceived by the King Rama IX to protect the urban area within its bounds (DSD, 2007). The river dike (Fig 4-8) replaced the traditional dam in Old Town Bangkok, which historically prevented riverbank erosion (EP-09/10). After the 1995 floods, the river dike was extended to 77 km with a height ranging from 2.5 to 3.0 meters above Mean Sea Level to prevent water overflow into the urban area. In 2007, a permanent water pumping station and drainage tunnels were established (DSD, 2007).

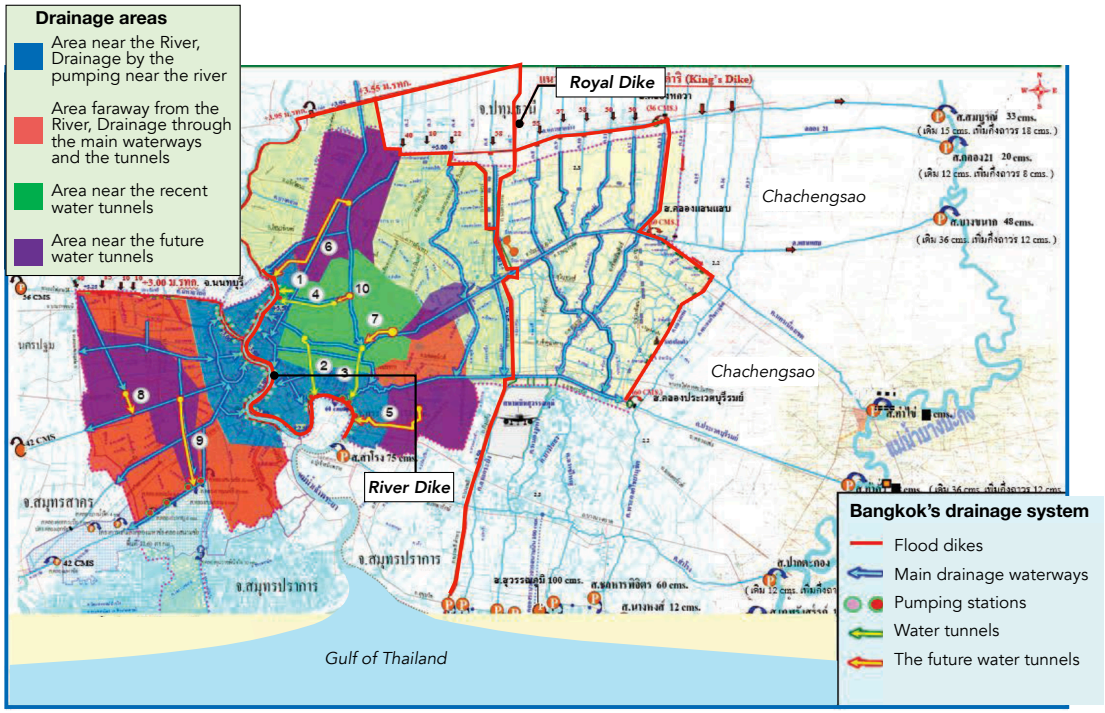


Fig 4-8 the flood protection management of Bangkok, adapted from (Purnell, 2011)

The waterways in Bangkok were measured and recorded as 1,165 canals with an overall length of 2,284 km (DSD, 2007). They are treated as drainage and sewerage channels to drain water out of Bangkok during heavy rain (Fig 4-9) (DSD, 2017-2020), rather than for floodwater discharge (Jular, 2017). DSD maintains the BUW's drainage function through regular dredging and the construction of embankments, paving the banks with concreted dam to prevent erosion and support the dredging work. The dredging aims to keep the depth of waterways at 3.00-6.00 meters to maintain drainage capacity (DSD, 2011). Although there is no definitive evidence of the transformation of BUW's watergates from facilitating historical water transport to supporting drainage, the establishment of the DSD in 1977 coincides with this shift (RE-01/EP-09/10).

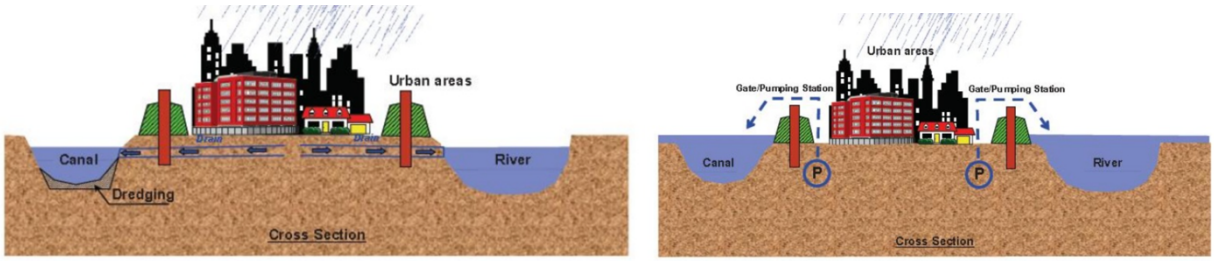


Fig 4-9 The concept of the flood operating system in Bangkok using structural measures (Somboon and Jaroenchaisakul, 2011)

The 2011 flood and waterways

During the 2011 flood, the government ordered the RID to divert water in the upper stream to the western and eastern rivers, instead of letting it flow into the lower Chao Phraya River (Komori et al., 2012). The temporary height of the river dike was raised by using sandbags to prevent the water level, which reached 2.53 meters, from overwhelming the urban area (Thanvisitthpon et al., 2018). Nineteen canals were designated as drainage channels for the water flow from the upper stream (Purnell, 2011) (Fig 4-10). Pumps were activated in all waterways to divert water out of the protected area (DSD, 2012) (Fig 4-9 Right/ Fig 4-11 Level 1). Consequently, floodwater was diverted and/or prolonged in other areas (Fig 4-11 Level 2/3) (Section 2.4.3 Chapter 2).

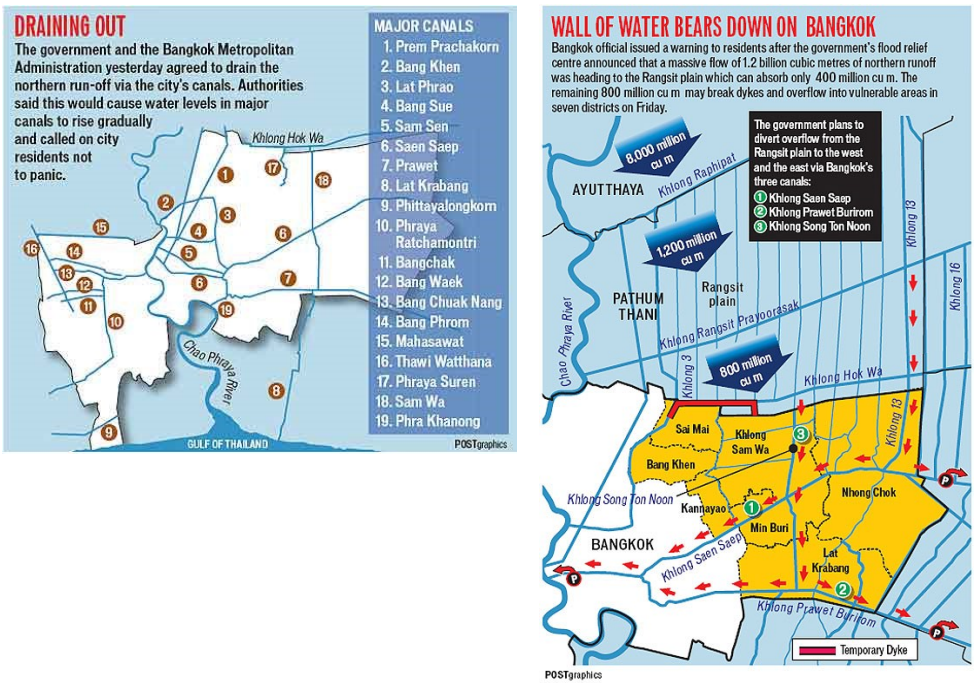


Fig 4-10 The major waterways that were picked to allow the northern water run-off (Left), the seven districts affected by the northern water (Right) (Purnell, 2011)

Meanwhile, blockages in drainage channels caused by garbage and debris accumulation, along with instances of structural failures like the broken dikes along the Raphipat Canal and

Prapa Canal, notably at the two primary gateways to Bangkok in Phatumthani and Nonthaburi (Fig 4-11). A total of 14 watergates and dikes were damaged (Jular, 2017).

Existing soft structure measures were insufficient. In particular, the number and size of the retention ponds in Bangkok and its surroundings were too small to hold the floodwater (Hungspreug et al., 2000). They were also less effective than they could have been because they were not connected to a network of waterways (EP-03/04). The approach of trying to keep water out to keep certain areas dry resulted in flooding among vulnerable communities (Phanthuwongpakdee, 2016) as discussed in Section 2.4.3 Chapter 2.

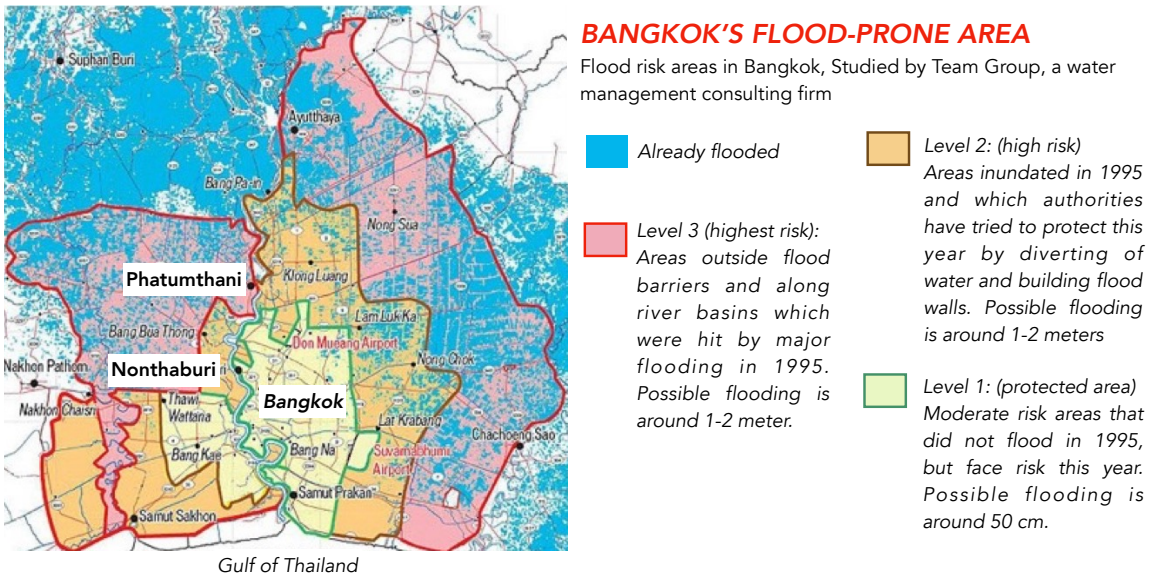


Fig 4-11 Bangkok and its surroundings with three hierarchies of flood risk area, Level 1-3 adapted from https://www.bangkokpost.com/news/local/261044/n accessed July 2022

Movement after the 2011 flood

The Japan International Cooperation Agency (JICA) implemented a national flood prevention plan in 2013 cooperation with the RID to minimise flood hazards in the Chao Phraya Delta. The plan aimed to protect critical infrastructure and safeguard zones (JICA, 2013), especially those with Japanese investments (Fig 4-12) (EP-02).

The ONWR's national plan for 2018-2028 outlines six key aspects: management of consumer water, enhancing water security in the manufacturing sector, flood management, water quality and conservation of water resources, preservation and restoration of deteriorated watershed forests, and soil erosion prevention, and establishing effective water management (ONWR, 2018) (Appendix 2A-2). In 2020, the ONWR initiated a proposal for flood prevention in the lower Chao Phraya delta. This proposal involves the creation of floodways both in the east and west, along with diversion channels intended to redirect water from the Chao Phraya River into these channels, which will have significant capacity (GA-01/04) (Appendix 2A-6). The ONWR also establishes the Reclamation of the Sanseab Canal Plan (2021) (Section 4.8).

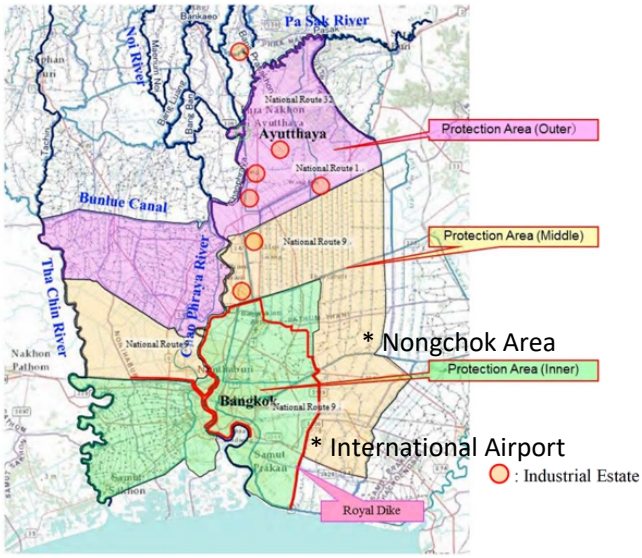


Fig 4-12 Map of the flood management by JICA to the delta scale (JICA, 2013)

At the Bangkok scale, in 2012, the riverbank was improved with maintenance work and construction of a water barrier. The height of the riverbank was increased to at least +2.00 meters, with an additional +0.40 meters added (DSD, 2012) (e.g., Fig 4-13). Other tasks included improving the capacity of water pumps, constructing drainage tunnels, and creating more retention ponds. The DSD report also called for improvements in communication with communities regarding orders to open or close the watergate, which was the main issue in the 2011's floods (DSD, 2012).



Fig 4-13 The riverdike along the River at the Kanlayanamit Temple (originally constructed in 1996, increase height in 2012)

The DSD's 2013 report outlined the management of informal settlements along BUW. It emphasised the need to enhance waterway capacity and address illegal encroachment by constructing concrete walls along BUW (DSD, 2013). This initiative, in cooperation with CODI, began in 2016 with projects such as the Lad Prao Canal Project (Appendix 2C-4) (GA-04) (DSD, 2016). In 2017, the 'Bangkok Resilience Strategy' was published addressing initiatives involving BUW likes transportation, returning areas to the public, also community-driven water resource management (BMA, 2017), despite limitation in the policy translation (Laeni et al., 2019) (Section 2.5.3).

Meanwhile, the DSD initiated a project in 2017 aimed at safeguarding northern water flow in Eastern Bangkok to prevent potential flooding at an international airport located to the south (Fig 4-12) through the construction of a flood dike (GA-01). This flood dike extends from the RID's work, protecting the water flow from the Simsam Canal through the Sanseab Canal in the Nongchok area (Fig 4-10 Right/Fig 4-12) (GA-01,RE-08/09,EP-04).

In summary, Sections 4.2-4.4 have provided an overview of BUW's position within the existing management structure, including a brief description of project implementation and an overall assessment of BUW's current situation. They provide a comprehensive view of BUW's role in conservation and flood prevention policy documents. The next section will chronicle the evolution of Bangkok's waterways over time.

4.5 History of Bangkok's waterways

4.5.1 Geography of landscape and early settlement (1470-1767)

The characteristic topography of the lowland of Chao Phraya Delta, which used to be low barrier islands and lagoons where Bangkok is now located, developed during ancient times (Takaya, 1969, Siriphattanakun, 2020). The young delta (Fig 4-14 Middle) formed 10,000 years ago after the retreat of glaciers from the last ice age (McGrath et al., 2015).

The lower delta area extending through the gulf (Fig 4-14 Middle), including Bangkok (Fig 4-14 Right), lies within the monsoon area, influenced by heavy rains from June to December and high tides from the Gulf of Thailand. Consistent with this topography, runoff from the upper delta merges with the river's flow in the floodplain, causing water levels to rise in the main waterways. Natural impediments to the flow of water inland occur as water backs up into tributaries and breaches riverbanks, leading to topographical flooding of the land (Komori et al., 2012).

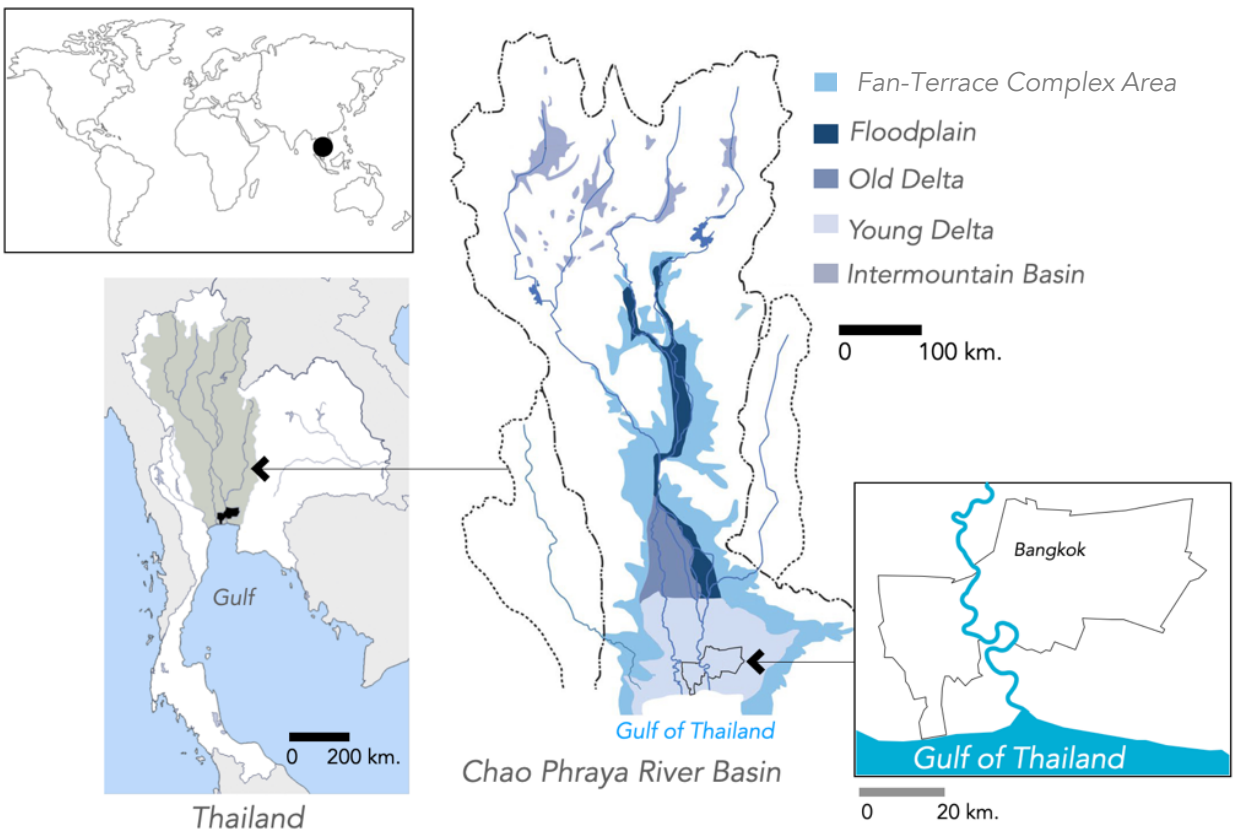


Fig 4-14 Thailand (Left), Chao Phraya Delta (Middle) (Thienvutichai, 2019), Bangkok (Right)

The Bangkok area was originally swampy land with natural waterways, and this lower deltaic plain would completely flood during the rainy season. This ecological process made Bangkok a favourable landscape for human settlement due to its fertile soil, which supported abundant food production such as rice and orchards (Aruninta, 2013, Thaitakoo and McGrath, 2008, Molle, 2007). The floodplain (Fig 4-14 Middle) was conducive to the excavation of waterways because the fast-moving mainstream water ensured that canals were not too shallow to use. This land reclamation allowed for the creation of artificial levees and canals to accommodate a growing settlement (Thaitakoo et al., 2012, Aruninta, 2013).

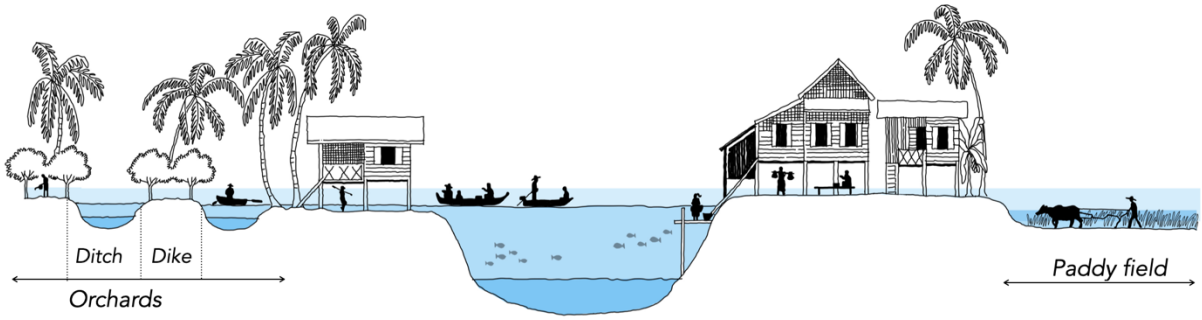


Fig 4-15 The waterways with their functions and the settlement relation, adapted from (Thienvutichai, 2019)



Fig 4-16 The trenches or water-flow into Lampradong or ditches in the orchards unit at ebb-tide (Left), The orchard plot of coconut tree consisting of ridges or dikes and trenches or ditches (Right) (Jarupongsakul and Kaida, 2019)

The settlers adapted to the water cycles by cutting the waterways for division, irrigation, retention, and transportation. Establishing these waterway networks transformed the marshy terrain into a highly productive area. Farmers dug small ditches to divert water from the river channels into farmlands to irrigation, while dikes served as flood control reservoirs. Paddy fields also benefited from water in the waterways, enabling annual rice-growing without relying solely on rainwater. During the rainy seasons, water naturally flooded into plantation areas through the waterways (Fig 4-15) (Tachakitkachorn, 2000, Yodsurang and Yasufumi, 2015).

The orchards and vegetable gardens display a pattern of rows delineated by small, dredged ditches alternating with built-up mounds (Fig 4-16/Appendix 2E-1). Twice daily tidal flows bring brackish water that merges with fresh water, enabling residents to collect fresh water for domestic use and brackish water for agricultural needs (Wongtimarat, 2013).

During the eras of Ayutthaya (1350s) and Thonburi (1767), periods predating the establishment of Bangkok (Appendix 2D), records document the excavation of man-made waterways known as *Khlong* in Thai. These waterways included connections between rivers and shortcuts waterways such as Lat Krung (Fig 4-17 No.3). Such excavations primarily served transportation needs, as the main river and natural waterways were often impassable, and overland routes were too lengthy for travel between small villages along the Chao Phraya River in the Bangkok area.

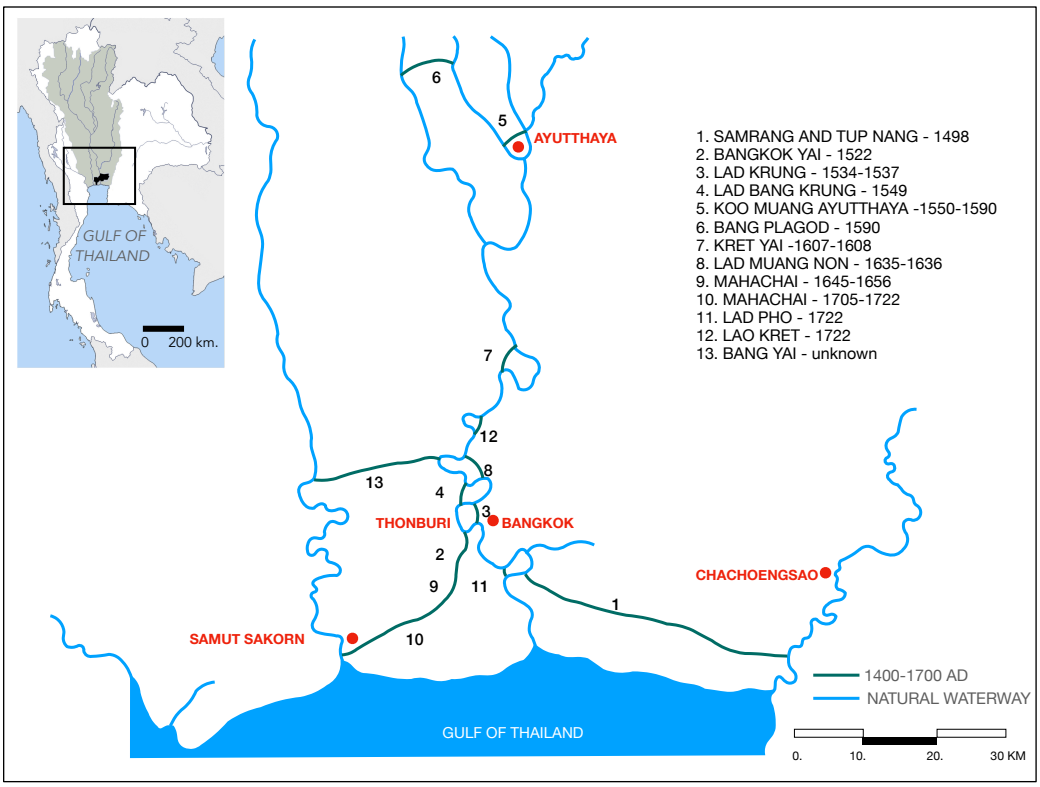


Fig 4-17 Waterway excavation records during 1400s-1700s, adapted from (Jiarakul, 2016, Nopkhun and Thadaniti, 1982)

4.5.2 Water city: Waterway excavation and its role in Bangkok (1782-1866)

The central city moved from the Thonburi (1767) or western Bangkok to eastern Bangkok, originally called “Rattanakosin” in 1782, marking the beginning of the Rama Dynasty. This was the official time of the city's establishment (LePoer, 1989), despite existing settlement before 1782 (EP-09/10). The reason for moving the palace from the west to the east was because the west bank eroded at the river bend, making expansion more difficult compared to the east. This included the difficulties in canal traffic, trade, and defence or military reasons. This proves that waterways significantly influenced the city settlement (Jiarakul, 2015).

The waterway excavation in Bangkok, initiated by King Rama I, began with the defensive canals or moats known as Khlong Koo Muang (Fig 4-18 No.1) in 1768, followed by Khlong Banglampoo (No.2) in 1782 for defense, drainage, and transportation. Khlong Lawd (No.3) facilitated water flow and transportation, while Khlong Mahanak (No.5) served public water festivals and connected areas beyond the historical canals. Khlong Sanseab (No.9) connected

to the Bangpakong River. The waterways were excavated and radiated outward from the city's centre, providing access to agricultural markets along the waterway. These vast waterway networks created the backbone of the city's functioning waterscape. They played multi-functional roles including agriculture production, transportation, town protection, places for trading, recreation, and daily chores (e.g. washing, bathing) (Jiarakul, 2015). This floated settlement of people along the waterway provided a flexible area for trade and community living (Yodsurang and Yasufumi, 2015).

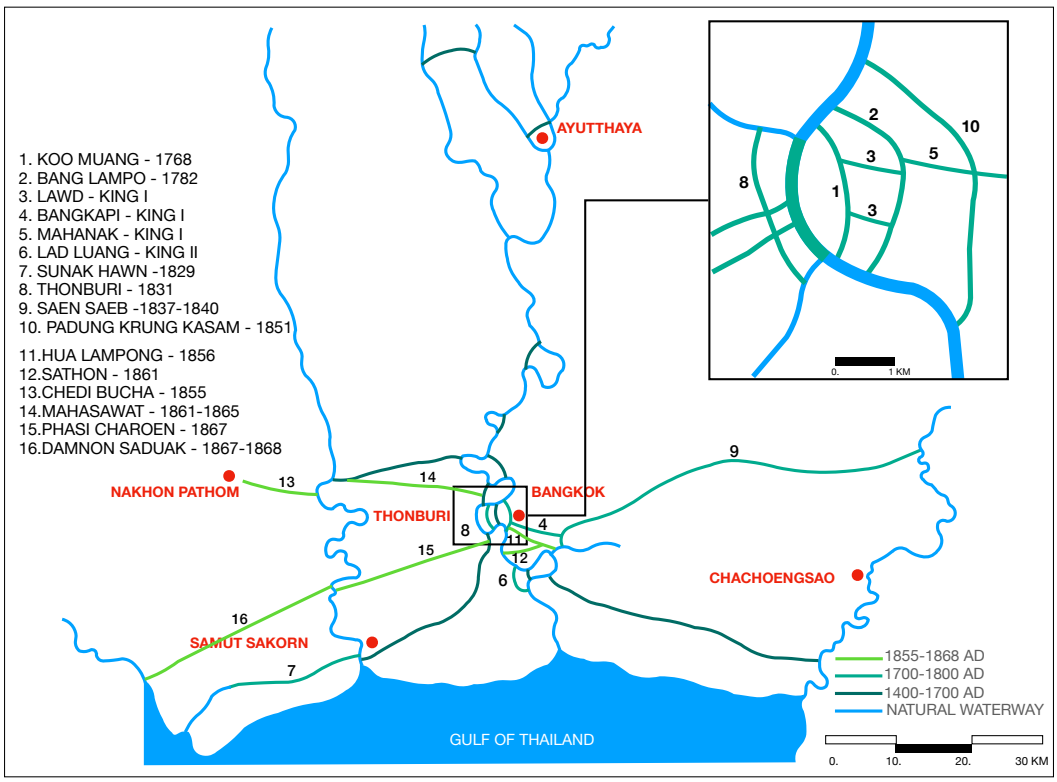


Fig 4-18 Waterway excavation records during 1700s-1800s and 1855-1868, adapted from (Jiarakul, 2016, Nopkhun and Thadaniti, 1982)

The pattern of settlement along the waterways, therefore, consisted of houses and shophouses, while raft houses generally floated along the rivers (Appendix 2F-1/2). The land between the fruit orchards and rice paddies was irrigated by minor waterways excavated by the villagers (Jarupongsakul and Kaida, 2019). The settlement was seasonally underwater as the water level rose naturally in the inundation area, created a unique character in respond to flooding and tidal conditions (Askew, 2002, Yodsurang and Yasufumi, 2015). This natural process required people to adapt their ways of life, including living in rafting communities, elevated housing, and other responses to hydro-ecological dynamics, both physically and culturally (Fig 4-19) (Tachakitkachorn, 2000, Tanabe, 1997, Dahiya and Thaitakoo, 2011).

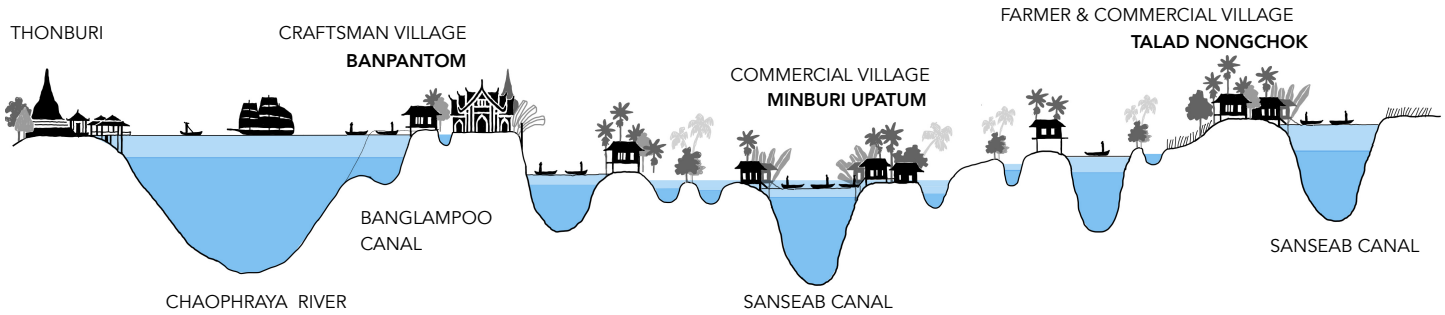


Fig 4-19 Historical overview of Bangkok's waterways

The waterside's settlement influenced various immigrants with diverse ethnic backgrounds to trade and settle (Shinawatra, 2012). This has resulted in water-based communities around the city that are described as local heritage manifestations of importance and comprise the diverse waterway neighbourhoods in Bangkok until recent time (Yodsurang 2015 cited Wichiencharoen 1993). Communities such as Banpantom, Minburi Upatum, and Talad Nongchok exemplify neighbourhoods that have a long-standing and deeply intertwined connection with the nearby waterways.

Following canal excavations in 1785, the first recorded flooding incident occurred. Subsequent floods in 1819 and 1831, during the reigns of Kings Rama II and Rama III, respectively, highlighted the damage to agriculture production and led to a famine in 1819 (Siriphattanakun, 2020). This later influenced the change in waterways irrigation system (EP-03/09/10).

The waterways became instrumental in Bangkok's economic expansion after the Browning Contract in 1855, transitioning from traditional agriculture to a thriving commercial system. Initial natural irrigation waterways proved insufficient, leading to extensive excavation projects to support both irrigation and trade. The surge in commodity exports transformed the riverbank into a bustling commercial hub. As water traffic congestion became an issue, King Rama IV enacted two Acts in 1857, marking the city's first modernisation policy for water transportation (Nopkhun and Thadaniti, 1982, Tanabe, 1997).

In 1856, Khlong Hualampong (Fig 4-18 No.11) was created parallel to a road to accommodate Western settlers. Simultaneously, Khlong Sathorn (No.12) was constructed parallel to Silom Road in 1861. This period saw a consistent pattern of building parallel waterways and roads, with bridges connecting both. The Browning Contract led to Western settlement along waterways near new roads. This development paradigm opened up new habitable areas and introduced new patterns of inhabitation and circulation. Additionally, during King Rama IV's reign, waterways connected to other cities, such as Nakorn Pathom (Fig 4-18 No.13), for royal visits, religious worship, and expanding paddy fields (Jiarakul, 2016, Nopkhun and Thadaniti, 1982).

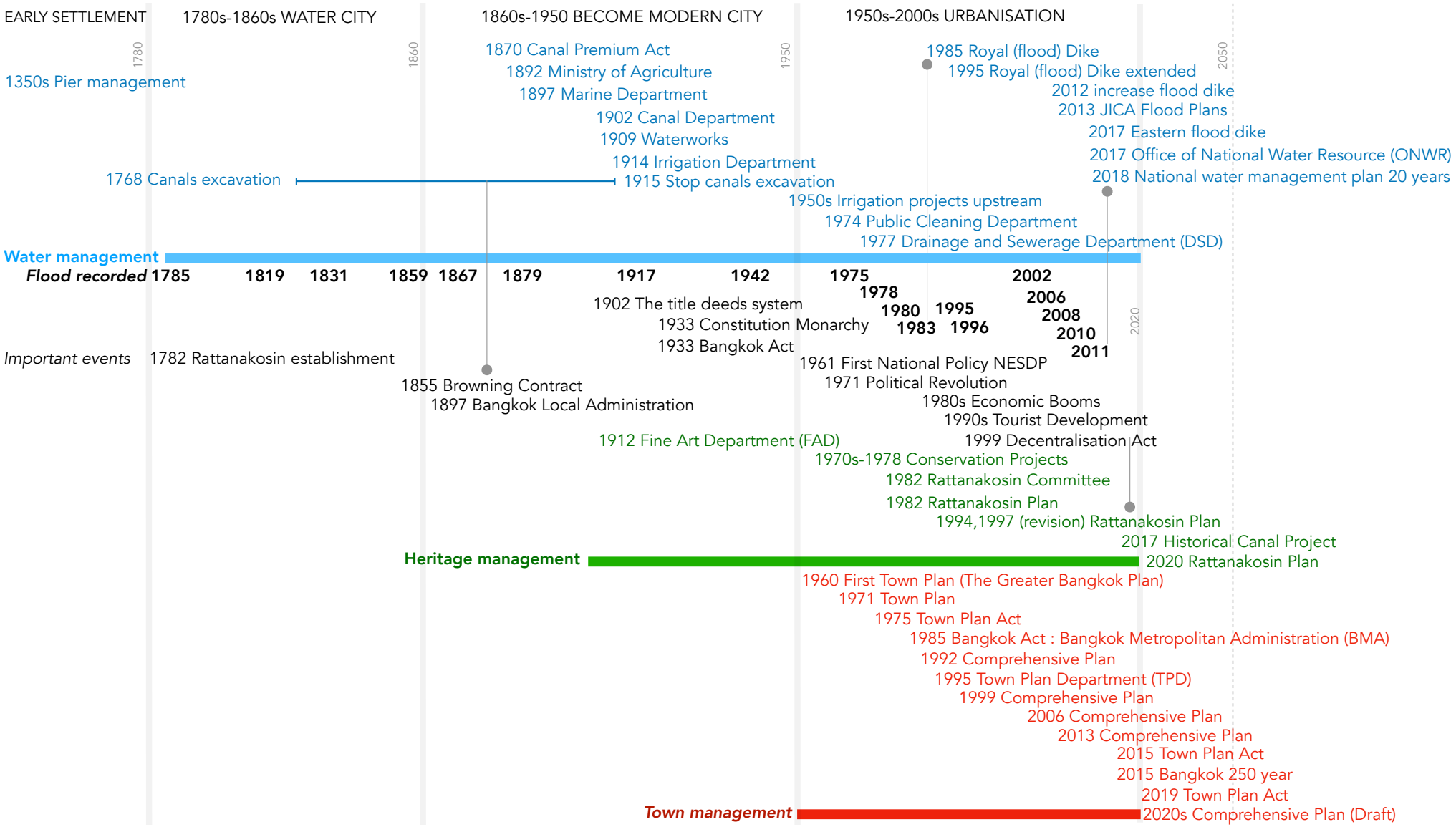


Fig 4-20 The chronology of the public management in Bangkok and those related waterways

4.6 Waterway change and urban development in Bangkok

4.6.1 Modern city with waterways emphasised: shifted approach (1860-1940s)

King Rama V's water policy (1868-1910) mirrored his predecessors' acknowledgement of the vital role of waterways in transportation, trade, and agriculture. To enhance rice cultivation, massive waterways were excavated, including the Rangsit Canal Project (Fig 4-9 No.8), but flooding in the 1960s and acid soil coincided with Rungsit shifting from rice production to orchards, later attracting settlers (Nopkhun and Thadaniti, 1982). In 1870, the Canal Premium Act was enacted to address water traffic congestion arising from trading activities and dense settlements along the waterways (Jiarakul, 2016). In 1892, the Ministry of Agriculture was founded to oversee rice cultivation and waterway irrigation influenced by Dutch Engineer Ven Der Heide (Brummelhuis, 2005). Later, in 1897, the city management was formally established under the Bangkok Local Administration, which covered trash, sanitation, building control, and refuse collection (Jonanan, 2000).

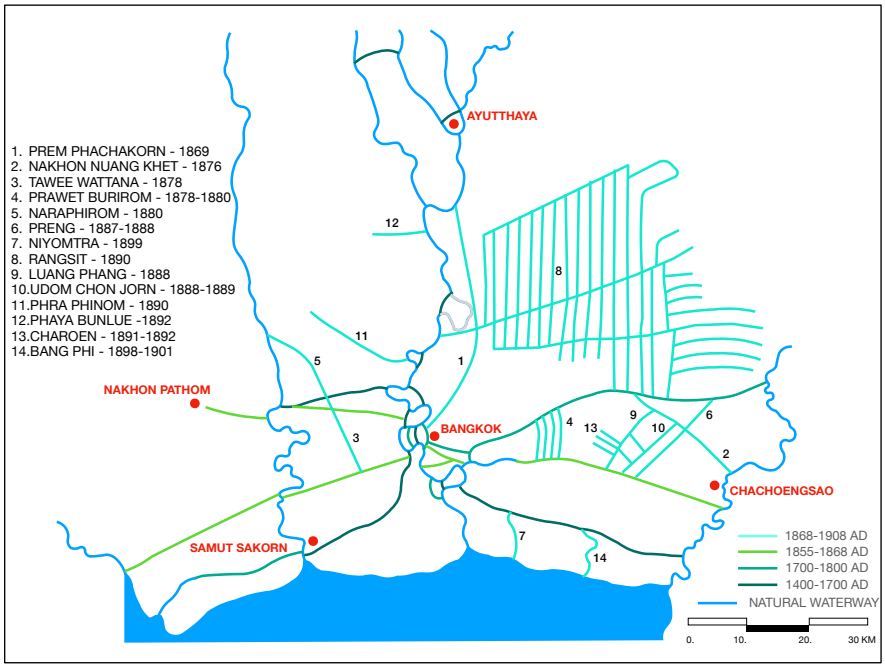


Fig 4-21 Waterway excavation records during 1868-1908, adapted from (Jiarakul, 2016, Nopkhun and Thadaniti, 1982)

In 1902, the King directed that areas where people desired to settle had to be reserved (Chaumpol, 2003), including encouraging people to reside beyond the city wall, i.e., the current conservation zone (RE-05/08/09). The system of land tenure was changed from the occupancy-by-use model to the title deeds system. The aristocracy received significant portions of land on both sides of the newly dug canals (Rongwiriyaphanich, 2012).

In this same year, 1902, the Canal Department *"Grom Khlong"* was established under the Ministry of Agriculture to maintain numerous waterways. The department constructed watergates during 1904-1910, such as those on the Sanseab Canal, to facilitate year-round transportation for trading (Jiarakul, 2015). The Pasak Irrigation Project (Fig 4-22 Left) was initiated in response to drought during 1909-1911. Issue with shallow waterways (Fig 4-22

Right) and acidic soil significantly occurred (Jiarakul, 2016), attributed to changes in river flow resulting from the adoption of Western advice and the implementation of division structures (EP-03). Later, the Phrapa waterworks, constructed in 1909, provided a non-potable water supply for the city (Tanusin, 2015).

Changes during modernisation included the establishment of the Fine Art Department (FAD) in 1912, indicating a growing awareness of cultural heritage preservation amid urbanisation (Shinawatra, 2012). Industrialisation brought about the replacement of traditional craftsmanship with mechanised methods, influencing changes in occupations and practices. The shift from rural to urban communities led to the mingling of various occupations, religions, and beliefs, further influencing cultural heritage and community's way of living (Nopkhun and Thadaniti, 1982).

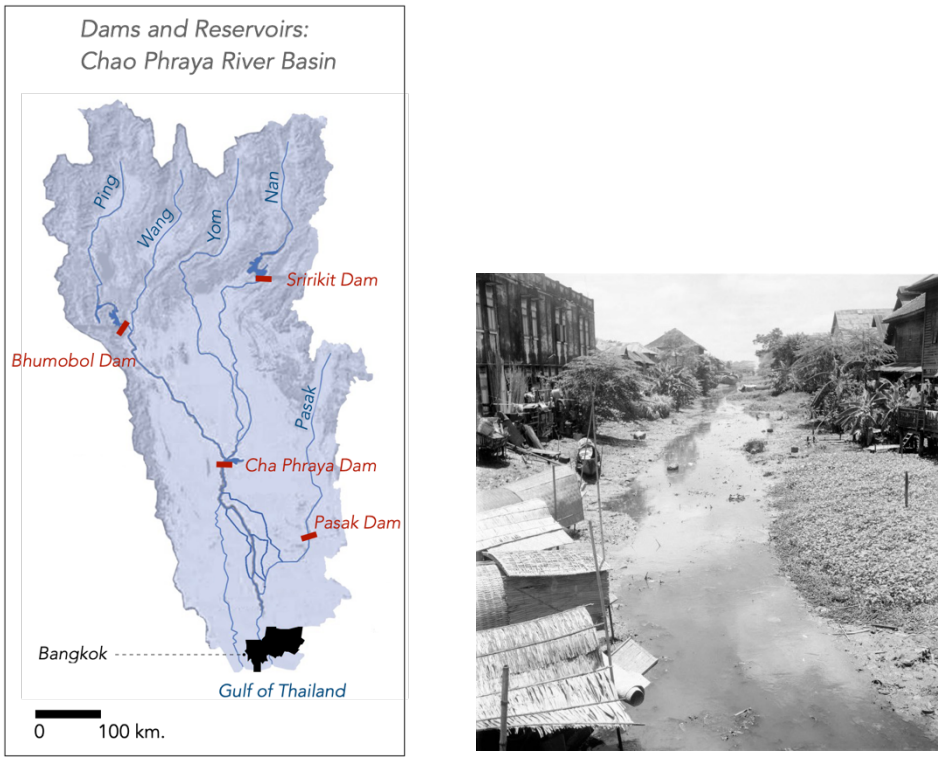


Fig 4-22 Regional scale: the irrigation projects in the upper Chao Phraya Basin (Left), adapted from (Thienvutichai, 2019) Minor scale: the shallowness of the canal at Phratu Pee in 1950 (Right) (Pendleton, 1957)

In 1914, King Rama VI established the Irrigation Department *"Grom Tod Nam"* (Jiarakul, 2015), taking over responsibilities from the Canal Department and shifting the focus from managing waterways to broader water resource management. Using modern technologies, such as reinforced concrete structures, the department implemented irrigation projects, following Western approaches. The construction of features like navigation locks and control structures aimed to raise water levels and divert water for irrigation (Brummelhuis, 2005). Notable dams like Bhumibol and Sirikit were constructed (Fig 4-22 Left) during the post-WWII period (1945 onwards) with the World Bank support (Molle, 2007) and aligned with the NESDP 1961, serving various purposes, including irrigation, hydroelectric generation, flood control, and navigation (Jarupongsakul and Kaida, 2019).

Irrigation projects controlled the water in the rivers (Fig 4-22 Left) and increased food production but created issues of water shortage and conflicts among users during dry seasons (Komori et al., 2012). Modern agricultural practices led to water pollution, shallowing of waterways (Fig 4-22 Right), flooding, and encroachment. Pesticide and fertiliser runoff polluted surface water, altering waterways. Changes in natural water flow and irrigation disrupted transportation and local irrigation. Flooding and subsidence resulted from manipulated water flow. Declining water quality exacerbated challenges, affecting daily life and water availability in the city (Jiarakul, 2016)

In 1915, the management approach to Bangkok's waterways shifted. Instead of dredging and maintaining the waterways, the focus shifted towards filling them and prioritising road construction (Appendix 2F-3). This change reflected a shift towards a street-based urbanisation model, influenced by Western approaches (Jiarakul, 2015, Nopkhun and Thadaniti, 1982). Accordingly, people prioritised access to roads over waterways. The new pattern of road-based building development turned its back on the waterways, resulting in socio-spatial marginalisation from outside through the lack of purposive engagement (Fig 4-23).

The altered landscape has shifted natural water dynamics and the system's ability of the system to manage water-related issues (Casper, 2015, Thaitakoo, 2017, Thaitakoo et al., 2012). Changes in water flow patterns and the reduced drainage system capacity have led to challenges with flooding, drainage, and water management in the city. Additionally, the construction of roads often blocked drainage flows and interrupted the natural drainage capacity of the waterways, further impacting surface runoff management (Komori et al., 2012, Hungspreug et al., 2000).

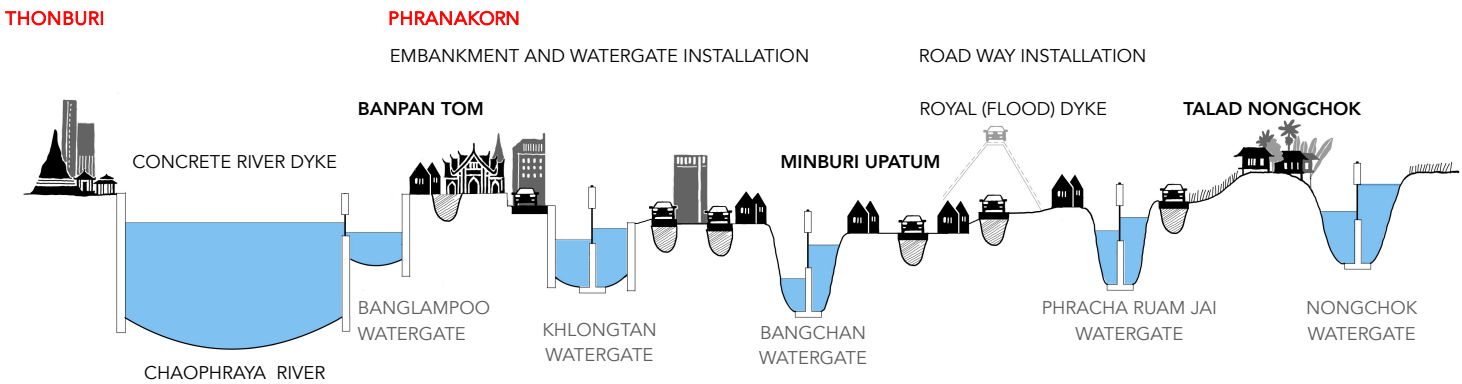


Fig 4-23 Bangkok waterways during the city's development (early 1900s)

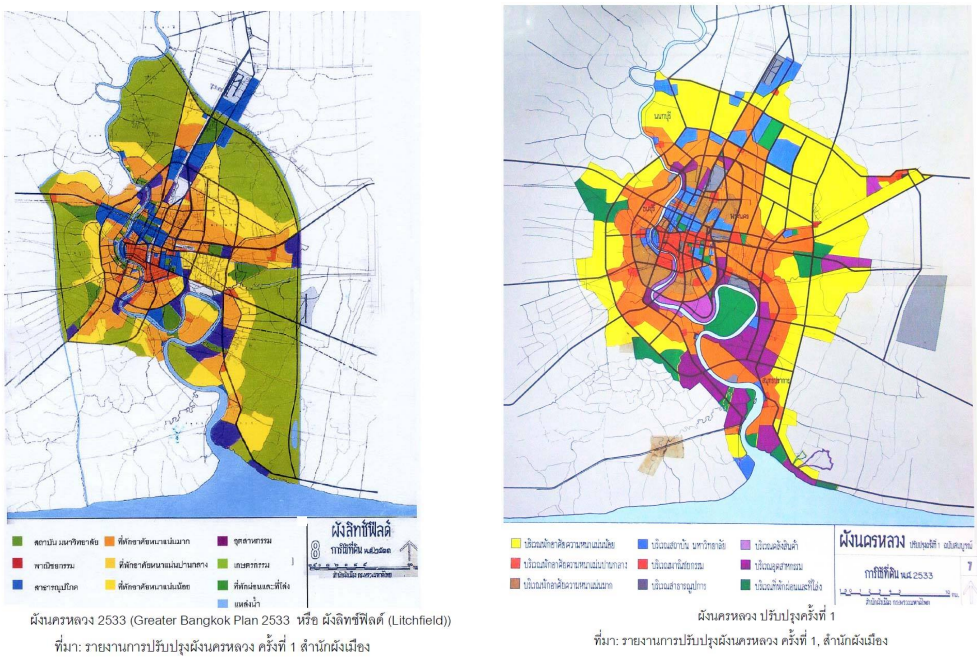
In 1932, following the end of absolute monarchy and the establishment of the constitutional monarchy, Bangkok was divided into *Thonburi* on the west and *Phranakorn* on the east of the Chao Phraya River. The Bangkok Act was enacted in 1933, leading to separate governance for low-density areas (Punyaratabandhu, 1985). During the city development, by 1945, numerous settlements along and above the waterways vanished, as the waterways no longer served the same purposes for the local population. The management of surface structures like raft houses and elevated houses along the waterway banks also ceased, further altering the waterways' functions (RE-01/05/08/09). The Bangkok Act was later developed in 1975 after

another political revolution, and then in 1985 with the establishment of the BMA (Sevilla, 2012).

4.6.2 Rapid urbanisation and neglected waterways (1950s-2000s)

Following the establishment of the first NESDP in 1961, urban development exploded. The strategy emphasised economic expansion through industry development and promotion of private investment, especially surface transportation development. Grey infrastructure was encouraged and heavily invested in, with private investor support for mid- and high-rise buildings. The waterways were extensively filled (Davivongs et al., 2012). From the 1970s onwards, large-scale development became more active, concentrating housing production in two areas: the inner core and the outlying suburbs (LePoer, 1989, Askew, 2002).

The growth of Bangkok and ongoing urban sprawl (Appendix 2K) has resulted in an unplanned pattern associated with the degradation of traditional heritage and changing social structure (Tantinipankul, 2012). Often, pockets of historic settlements have deteriorated into informal settlements (Unakul, 2012). Bangkok's waterways have shifted from being important to neglected features with poor ecological and cultural services (Thaitakoo and McGrath, 2008, Dahiya and Thaitakoo, 2011).



ผังนครหลวง 2533 (Greater Bangkok Plan 2533 หรือ ผังลิทช์ฟิลด์ (Litchfield))
ที่มา: รายงานการปรับปรุงผังนครหลวง ครั้งที่ 1 สำนักผังเมือง

ผังนครหลวง ปรับปรุงครั้งที่ 1
ที่มา: รายงานการปรับปรุงผังนครหลวง ครั้งที่ 1, สำนักผังเมือง

Fig 4-24 The Greater Bangkok Plan making in 1960 (Left), the revision of 1971 (Right) (TPD, 2015)

In 1960, the US firm Litchfield Whiting Brown & Associates created 'The Greater Bangkok 1990' 30-year-plan for the Thai government (TPD, 2015) (Fig 4-24 Left). Initially emphasising streets as the city's backbone (Deewattanakul, 2016), with no mention of the waterways. The plan underwent changes by PWTPD in 1971 during the political revolution, expanding the boundary and reassigning agricultural areas for residential use (Fig 4-24 Right). Thonburi and Phranakorn were officially merged and governed by a Governor (Wolfe, 2002). For the waterways, the National Public Works Department established the Public Cleaning Division to

maintain drainage sewers, restore waterways, and dispose of rubbish. It was reorganised in 1974 as the Public Cleaning Department (PCD) to handle water drainage, solid refuse collection, and disposal. the Drainage and Sewage Department was officially founded in 1977 and separated from PCD, expanding its responsibilities to include flood protection (Appendix 2L) (DSD, 2015).

In 1975, Bangkok established a distinct local governance system with an elected administration, Governor and legislative council after be appointed by MOI (Wolfe, 2002). The Bangkok comprehensive plan was established by TPD in 1992 (Fig 4-25 Left) (Ratanawaraha, 2016b), which delineated the Bangkok's boundary differently from the plan announced in 1971 by the national agency, PWTPD (Fig 4-24 Right). In TPD's plan, Bangkok's boundary encompassed low-density areas on the eastern and western sides which eventually became the city's boundary (EP-03). The TPD later developed subsequent plans in 1999, 2006, and 2013, and the most recent unofficial plan in the 2020s (Fig 4-25 Right) (BMA, 2019).

This recent **2020 Comprehensive Plan (draft) by TPD** (Fig 4-25 Right) underwent public hearings from 2018 to 2020. One proposal from this new policy includes 'an overlay zone' for conservation and commercial areas, aimed at facilitating building permit and commercial activities in conservation areas. The waterway mentioned here are primarily discussed for their role in drainage capacity. Some BUW are designated for irrigation when located on the outskirt. The area adjacent to BUW is proposed to be designated as public spaces (Appendix 2A-4/A-5) (TPD, 2019).

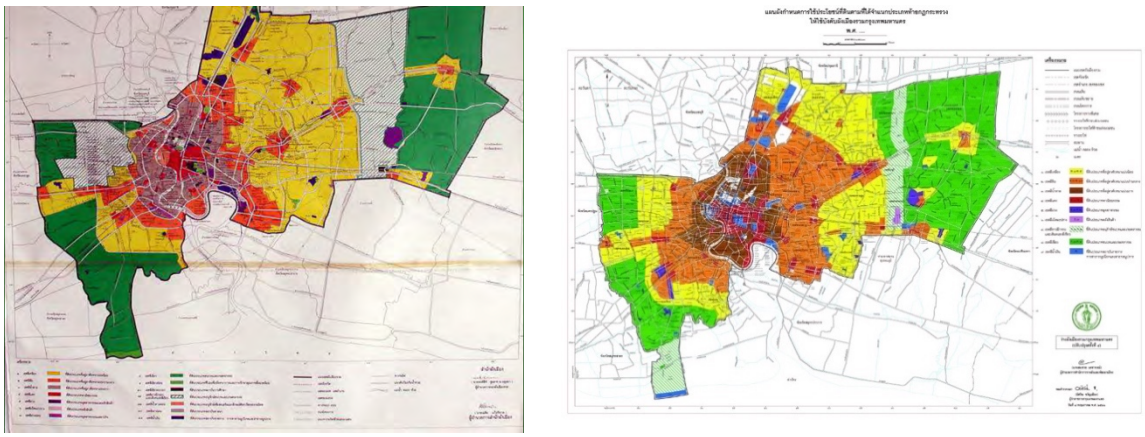


Fig 4-25 Bangkok comprehensive plan 1992 (Left), 2020s's plan (draft) (Right) (TPD, 2019)

During the economic boom of the 1980s with the force of political ecology in Thailand (Section 2.4.3), the uncontrolled growth led to infrastructure bottlenecks and the proliferation of informal settlements (Torrès, 2004). The lack of comprehensive planning (Fig 4-25) and enforcement of regulations resulted in uncontrolled private property ownership and rising land prices (Wolfe, 2002), contributing to gentrification and the diminished cultural heritage (Shinawatra, 2012, Tantinipankul, 2012).

In 1990, the UNESCO's recognition of Sukothai (Appendix 2D) as a World Heritage Site marked the beginning of tourism, which also centred around the Old Town Bangkok, leading to redevelopment projects (Section 4.3) that disturbed historical communities (Sirisrisak and Akagawa, 2012, Aboutorabi, 2018, Shinawatra, 2012), most of them located along waterways.

The Enhancement and Conservation of National Environmental Quality Act was introduced in 1991 to protect cultural heritage, but the comprehensive plan of 1992 (Fig 4-25) prioritised modernisation over heritage preservation, leading to the replacement of historical areas with contemporary urban development (Punyaratabandhu, 1985). This influenced the eroded relationship between waterways and communities (Fig 4-26)

Rapid urbanisation and extensive infrastructure investment has caused land subsidence exceeding 10 cm/year due to groundwater use for domestic and industrial purposes. Remedial actions include managing groundwater pumps and slowing the sinking rate (Singkran and Kandasamy, 2015, Jha et al., 2012).

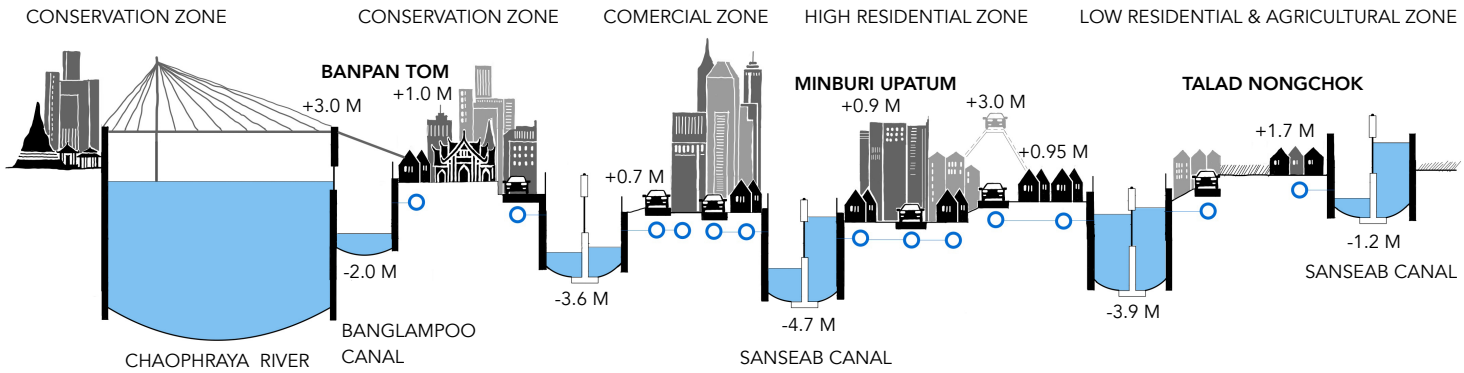


Fig 4-26 Recent overview of Bangkok's urban waterways

Pressures on water control structures and upstream dam construction (Section 4.4) have resulted in a highly controlled waterway, replacing vegetated areas with commercial and residential development (Molle, 2007). Drainage system capacities reach their limits, causing extensive flooding (Table 4-1) in Bangkok and surrounding suburbs (Komori et al., 2012). The focus have shifted from preventing floods in cultivated land to addressing inevitable flooding in residential areas, particularly in Bangkok (Singkran and Kandasamy, 2015). Flooding in the Chao Phraya Delta is no longer considered a natural phenomenon (Thanawat Jarupongsakul, 2019).

Year of record	1983	1995	1996	2002	2006	2008	2010	2011
Water Level in the River (m.)	2.13	2.27	2.14	2.12	2.22	2.17	2.10	2.53

Table 4-1: Flood recorded (Komori et al., 2012)

In summary, Sections 4.5 and 4.6 have provided a comprehensive overview of the changes in Bangkok's waterways. They present the historical waterways from the early settlement period to the traditional agricultural pattern (1470-1767), the initial city's establishment and the roles of waterways for defense, public transportation, and massive irrigation (1782-1866). This includes the shift from excavating to filling canals during city modernisation (1860-1940s), leading to significant changes in waterways during the period of uncontrolled city expansion (1950s-2020s). The next section will provide a detailed chronology of the three study sites.

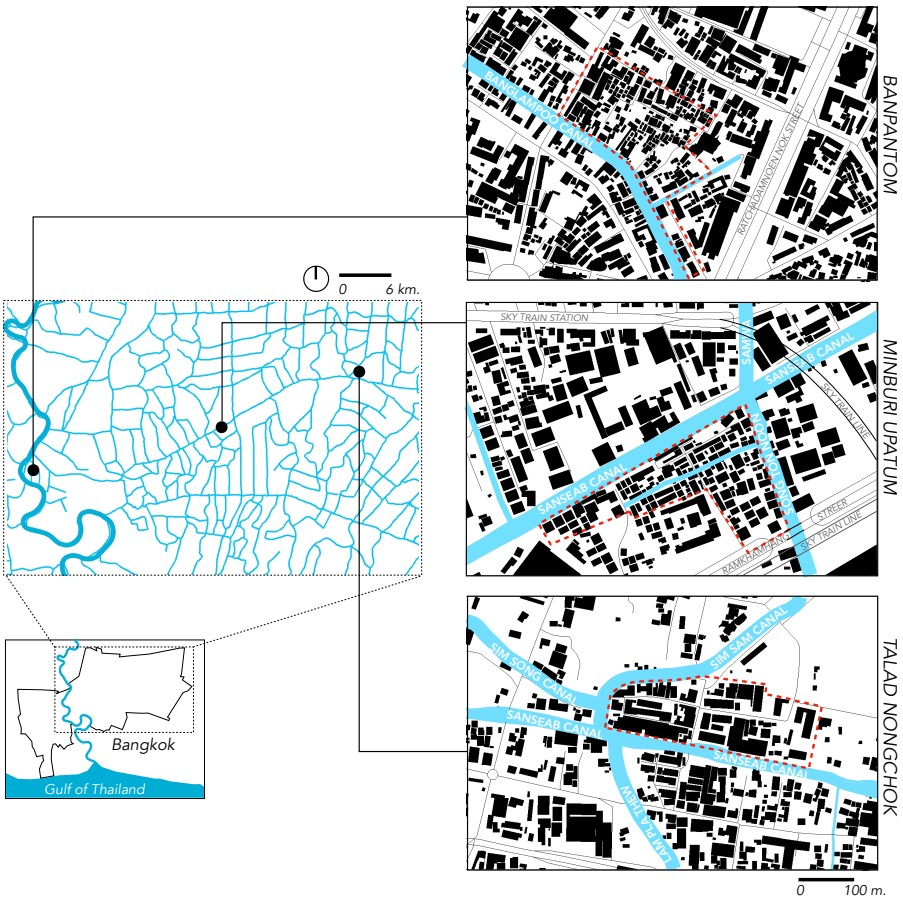


Fig 4-27 The three study sites

4.7 Banpantom Community and the Banglampoo Canal

Before the Banglampoo Canal was constructed, this location was typical of Chao Phraya lower delta settlements with small communities, i.e., Samphraya and Chanasongkram, before the establishment of Rattanakosin (Askew, 1993). The surrounding areas comprised orchards or agricultural areas with minor manmade canals or irrigation channels, i.e., *Lam Phradong* or *Lamrang* in Thai. The communities reclaimed the ground and opened it up to agriculture and transport by creating tributaries from the main waterway channel (EP-09/10).

King Chai Racha Thirat ordered the construction of the shortcut canal named *Lad Krung* (Fig 4-17 No. 3) in 1537 at Khlong Bangkoknoi to Bangkokyai (Section 4.5.1). This shortcut waterway eventually became the primary route of the Chao Phraya River, as most transportation activities shifted there. This resulted in the water flowing through *Lad Krung* widening the channel, surpassing the original river channel in significance, and becaming the main waterway influencing the landscape around (Ausawasakunruecha and Pinyo, 2019). The study site's geographical position is nearby the Chao Phraya River, which used to be the manmade or shortcut waterway.

Later, when Rattanakosin was created in 1782, the Banglampoo Canal (Fig 4-19 No. 2) was erected as the second defensive canal. This canal was excavated over a length of 3,426 m, 20

m. wide and 2.5 m. deep. Along this canal, the city wall, forts, and city entrances were built as defensive features (Fig 4-28). The King named the canal *Khlong Robkrung*, meaning a canal surrounding the city in Thai. Residents used various names for the canal, aiding in navigation by indicating specific locations. For example, the Banglampoo Canal derived its name from the abundance of Banglampoo Trees along its route (Ausawasakunruecha and Pinyo, 2019).

Following the creation of the Banglampoo Canal, the early initial village became located near the royal palace, which was the center of government at that time. The area became popular for government officers to settle (RE-01/02). This was a significant physical change in the area when the city wall was created, leading to the separation of the area between inside and outside the court (EP-03/09) (Fig 4-28). This meant the area became strategic with the Banglampoo Canal passing through its center. The Canal was connected to many small waterways, including ditches around the area, which served transportation and local food production. Later, the third defensive canal, Padungkrungkaseam (1851) (Fig 4-19 No.4) and the city wall extended the city's boundary, aiming to protect the inundation of the area (EP-03/05).

The study area covers the two historical artisan villages BanPan and BanLor, now collectively known as Banpantom. *Ban* means village, and *Pan* and *Lor* represent the crafting process or materials. BanPan was settled along the narrow alley known as called 'Trok BanPan'. BanLor was settled along the minor waterway, BanLor Canal, which was connected to Banglampoo Canal and other waterways (Fig 4-28). These villages were originally recorded in 1892, with BanPan first founded in 1884 during the reign of King Rama V (Shuchaiya, 2001).

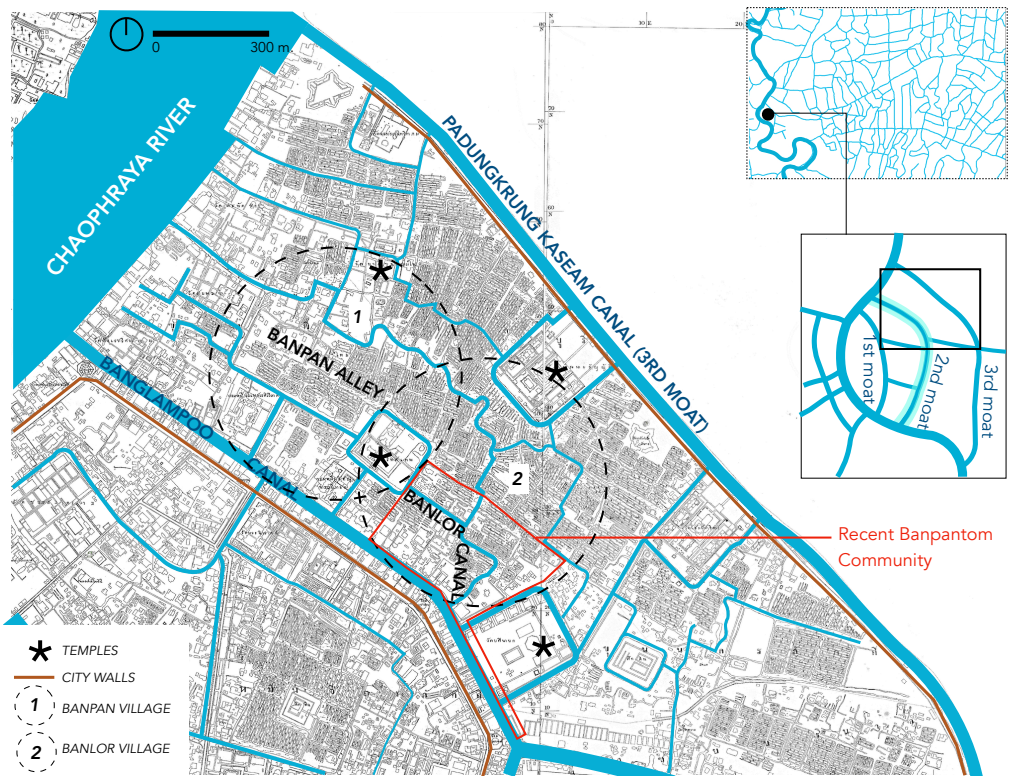


Fig 4-28 The waterways network in the Tork Banpan and Ban Lor Canal Communities, adapted from 1887's historical map (RTS, 1887)

The historical evidence shows that the villages were located near the temples, which was typical of the structure of ancient villages, with many surrounding waterways. There were mangos gardens that relied on the manmade minor waterways in the neighbourhood (Fig 4-29), as shown in historical maps of 1887 and 1932 (RTS, 2006, RTS, 1901, RTS, 1887) (Appendix 2G). The villagers were comprised of government officers who lived in traditional wooden houses, as well as high society or noble family, including craftsmen serving the palace, and other artisan communities (Klamsom, 2008, Shuchaiya, 2001). The land use along the Banglampoo Canal used to include a mix of markets, sawmills, shipyards, and villages (Fig 4-30).

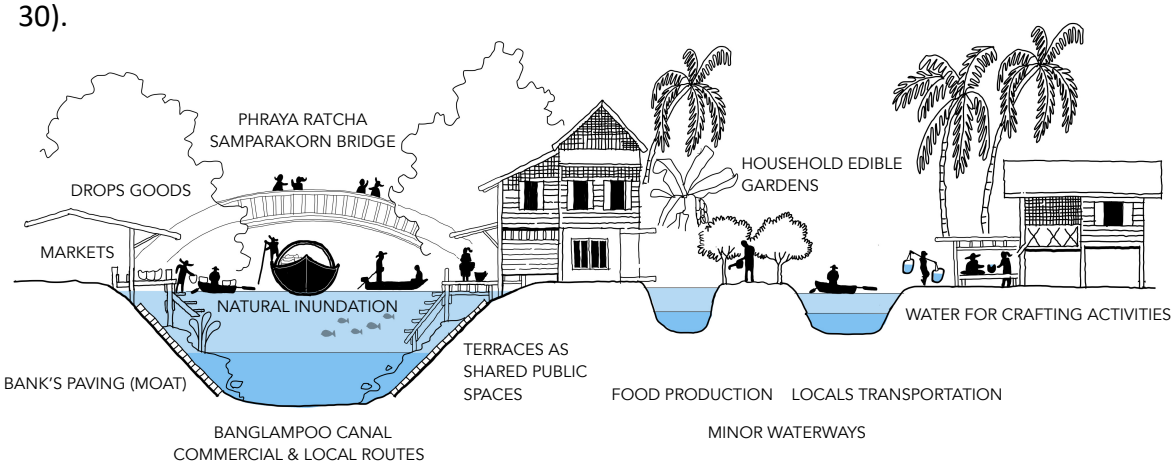


Fig 4-29 Historical overview of the Banglampoo Canal and the minor waterways

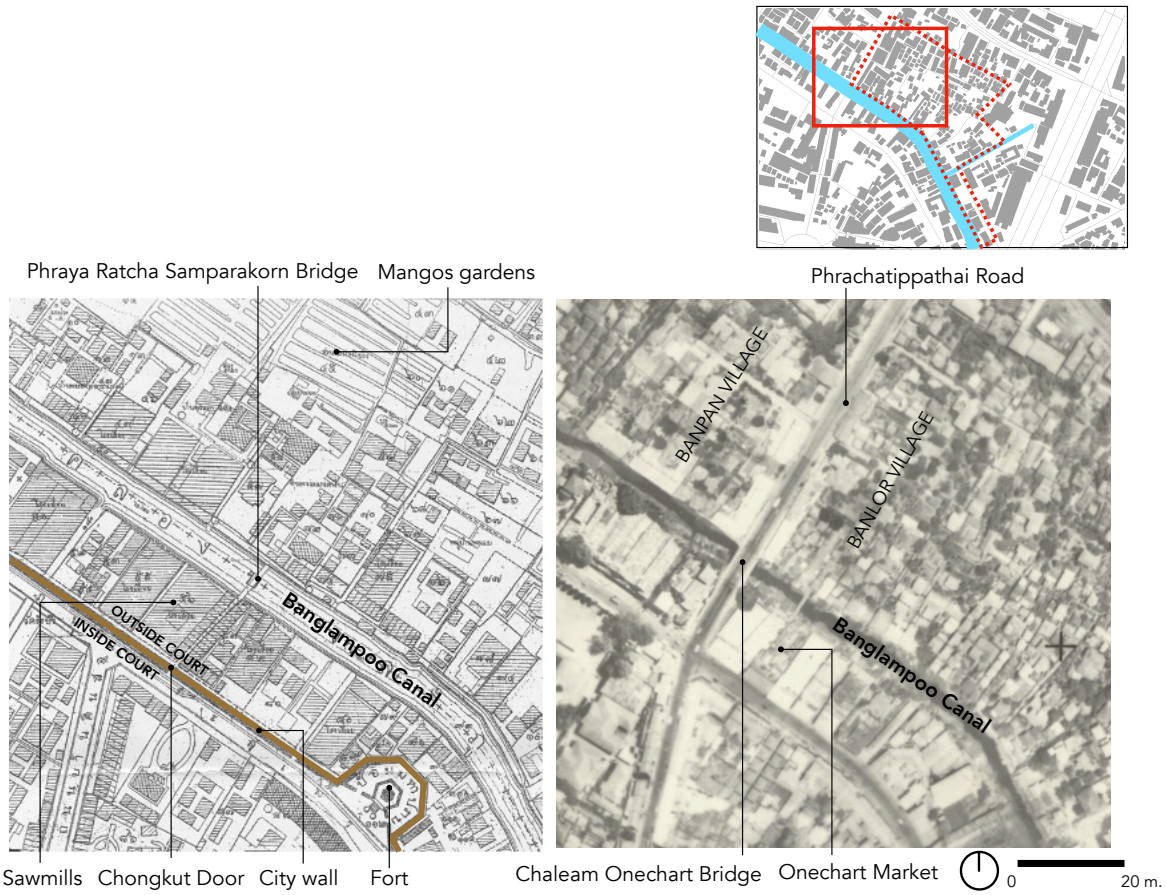


Fig 4-30 Banpantom's area before 1926 (Songsriri, 2017) (Left), in 1958 (Right) (NLA, 1985)

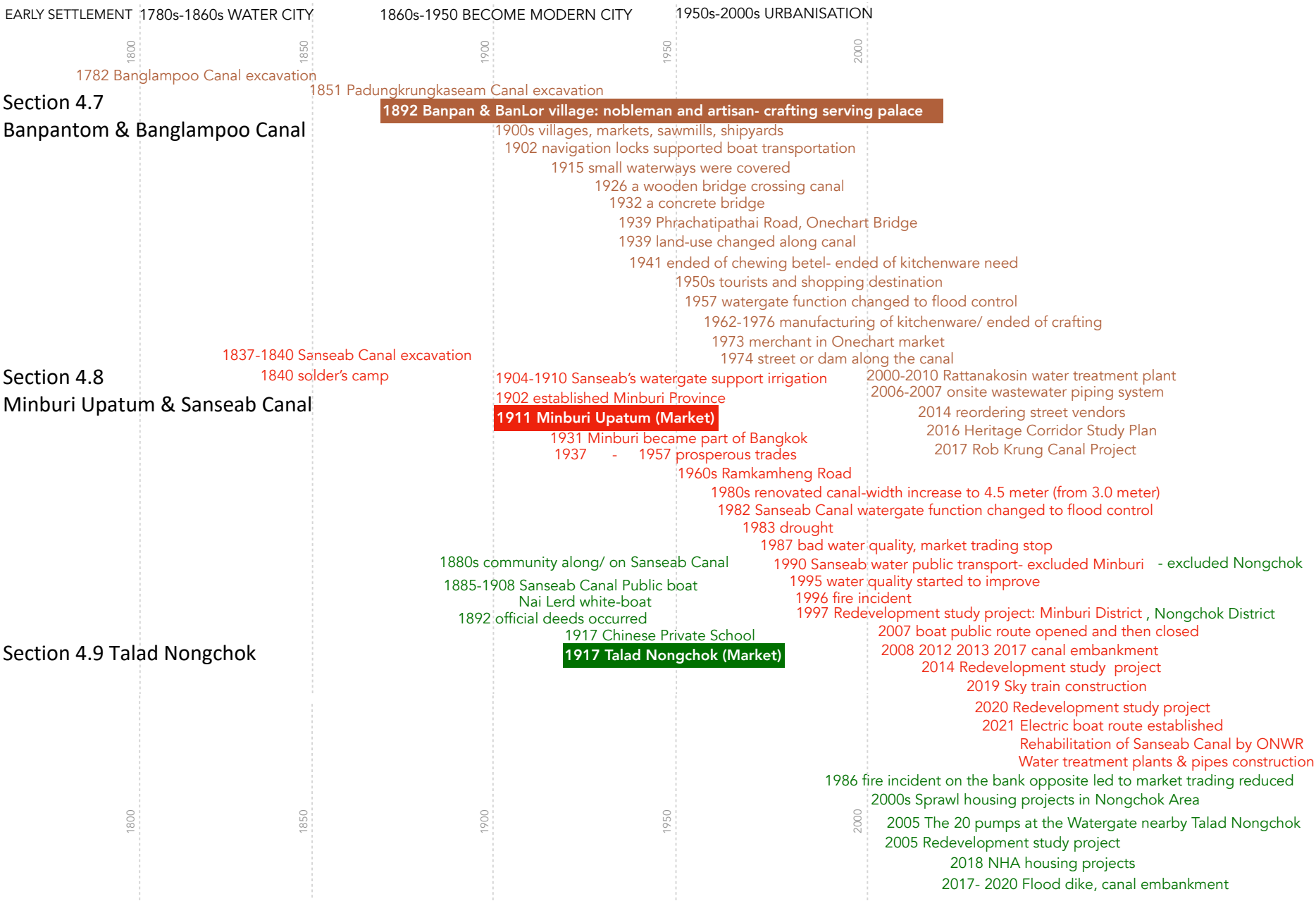


Fig 4-31 Diagram showing the chronology of the three communities

Around 1926, the Phraya Ratcha Samparakorn Bridge was built in this community. The bridge, which was positioned at the Chongkut Door or the gate, separated the area between the court and the city wall (Fig 4-30 Left). The bridge was built originally built to serve a royal family, but it later became the main circulation route for townspeople once the material was changed from wooden to concrete in 1932 (Klamsom, 2008).

In 1939, the main road was built during King Rama V's reign, along with the construction of Chaleam One Chart Bridge, to accommodate car transportation. The street was originally constructed to reach the Constitutional Monument, or *Phrachatipathai*, which later became 'Phrachatipathai Road' (Shuchaiya, 2001) (Fig 4-30 Right/4-32). The minor waterways were covered during the street-base development from 1915 onwards (Appendix 2G) (RE-01/03/04).

From the 1950s, the Banglampoo area was a major shopping destination. This neighbourhood was home to several well-known markets, including *Yot* and *Durian* Markets. There is great variety and depth of national culture to be found in this unique neighbourhood where various palaces of Royal Princes and the Royal Family were located (Klamsom, 2008). At the same time, urbanisation (1950s) occurred, and the crafting capacity ended in 1962-1967 due to mechanisation when hand manufacturing of kitchenware was no longer required (Songsriri, 2017).

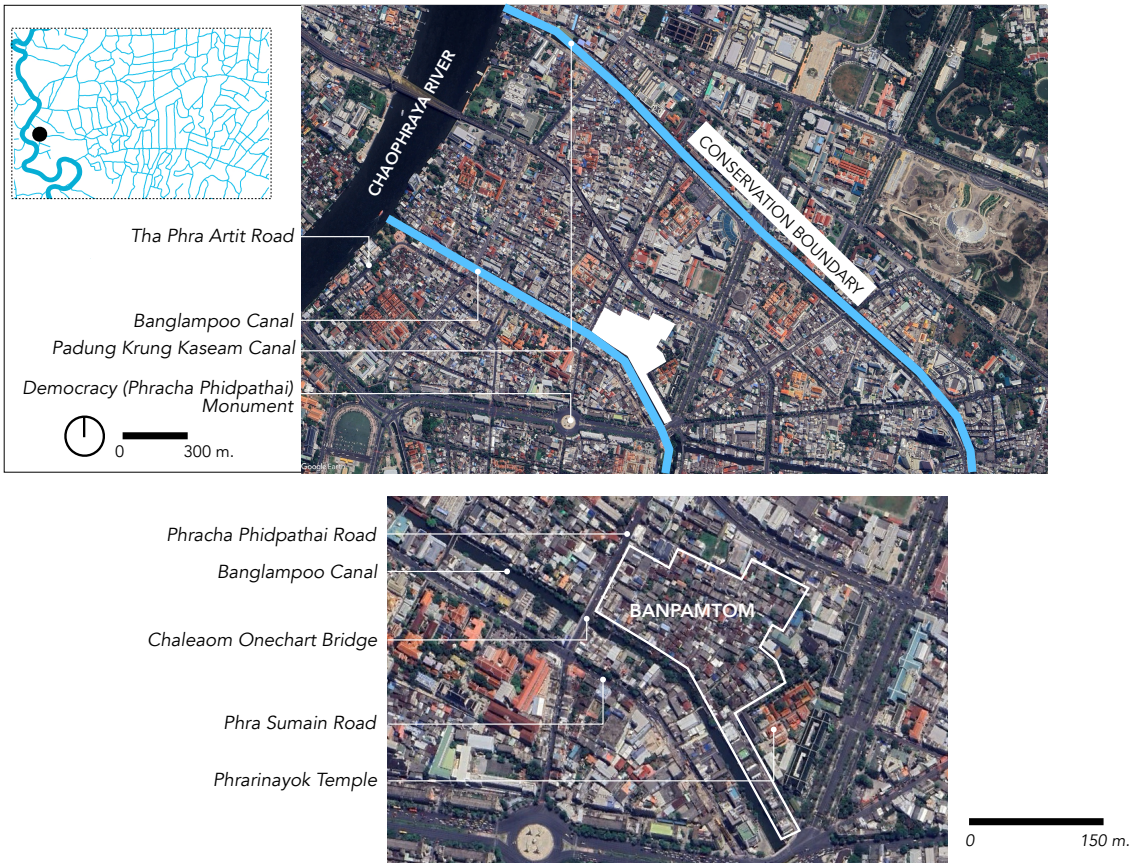


Fig 4-32 Banpantom Community, adapted from Google Maps, accessed 2023

Banpantom's social structures altered, leading to a mix of residents and departures due to changes of occupation and gentrification (Askew, 1993). Different types of employment, ,

such as grocery merchants, became prevalent. Chongkut Door, which used to be a wooden shipyard, was developed into a market in 1973. Consequently, the name Chongkut disappeared, along with the fort and city wall, now known as Onechart Market (RE-01/02/03) (Fig 4-30 Right). The dam, which runs parallel to the waterway, was constructed in 1974 (RE-01/04), when many conservation projects were initiated by FAD (1970-1975).

Not long after the Rattanakosin Plan (Section 4.3) was formed in 1982, Banpantom was included in the conservation boundaries and protected area (Fig 4-32) (ONEP, 1994). The revision and later Rattanakosin Plans (1982, 1994, 1997) contributed to orderliness along the waterways by constructing railing, footpaths, and improved lighting, as well as renovating the material along the canal. However, the recent plan (2017-2020) (ONEP, 2017a) had no physical influence on the community. The riverside was built with an embankment in 1996 to protect the urban area from inundation and water flow from the river (Section 4.4). Later, the conservation area's sanitation was improved in 2006-2007 by a system of wastewater pipes linking households directly to the Rattanakosin treatment plant (2000-2010) (DSD, 2007).

During the 1990s, the Banglampoo District became a tourist attraction as a historical area (Section 4.3). When Onechart Market was closed due to changes in land use during rapid urbanisation, the dam/roadway along the Banglampoo Canal in Banpantom was developed by local merchants into a dense market street in the 2000s. In 2014, the LED removed a large number of street vendors along the canal in Banpantom to reduce the street density (RE-01/03/04).

Other waterways in the conservation zone have become an important component of urban water management for flood protection. The Banglampoo Canal has been managed alongside other structural measures to ensure the water level does not inundate the conservation zone (Section 4.4). The watergate (1957) (Fig 4-33 Left) and pumping station have been installed at the mouth of the waterway (RE-01), connecting it to the river and controlling the water level to ensure it remains low enough to handle heavy rain (DSD, 2007, DSD, 2020a). The waterway's cleanliness is always preserved as a historical landmark (ONEP, 1994).

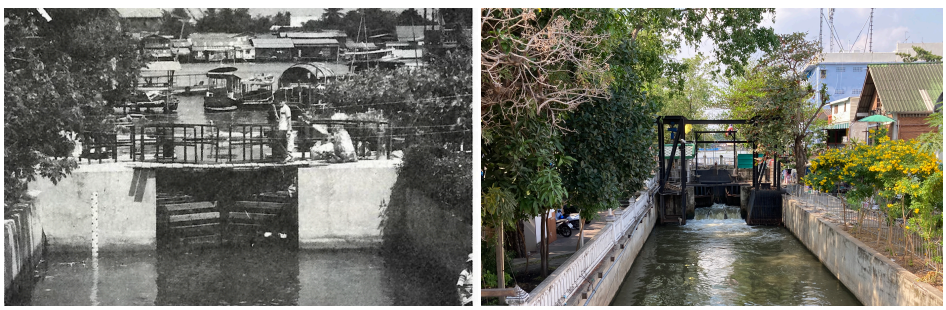


Fig 4-33 The watergate at Banlampoo Canal connected to the River after 1957 (Left) Source: http://banglamphumuseum.treasury.go.th/en.php4 accessed April 2021, The watergate in 2022 (Right)

In 2016, the plan for the Banglampoo Canal's cultural heritage corridor was formed as a study project specifically carried out for the community by Chulalongkorn University, Faculty of Architecture and BMA (CU, 2016). The study provided information on traditional architectural buildings (TPD, 2017) and recommended that future development should harmonize

architectural styles, maintain connectivity with the waterway, and improve public space accessibility in the area adjacent to the Banglampoo Canal (Appendix 2H-1) (Issarathumnoon, 2016).

In 2017, TPD launched the Khlong Rob Krung Redevelopment Project, which is scheduled for completed by 2032. The plan includes proposals for the redevelopment of areas, including the Banpantom Community and the area along the Banglampoo Canal (Appendix 2H-2) (TPD, 2017).

4.8 Minburi Upatum Community and the Sanseab Canal

Before the excavation of the Sanseab Canal, eastern Bangkok was a swampy area with natural lagoons. The landscape was rich with fish, and the eastern area was covered with natural forests (EP-03/09/10). The Sanseab Canal was excavated during the reign of King Rama III, between 1837-1840, to connect the Chao Phraya River to the Bang Pakong River (Fig 4-18 No.9/Fig 4-34) (Nopkhun and Thadaniti, 1982) (Appendix 2E-2), spanning approximately 72 km in length (DSD, 2007).

The original purpose of this excavation was to support city expansion, i.e., to transport weapons, food, and soldiers to Youan (Vietnam) during the Thai-Yuan war (from 1717), which lasted 14 years. Following the canal excavation, a soldier's camp was established along the waterway (EP-03), and Chinese labourers who were brought in for the canal excavation began to settle permanently (EP-03/09/10/RE-05/08). As a result, there was a diverse mix of ethnic groups along the Sanseab Canal. Moreover, Muslim settlers from Malayu and Cham backgrounds arrived in the eastern area, following the command and encouragement of the Thonburi King (Jiarakul, 2015).

King Rama V wrote about the Sanseab Canal in his journal during his visits locals, emphasising the waterway's significance and the surrounding area before the city modernised. One entry noted his morning departure time coinciding with the natural rise in water levels. The journal also documented the presence of typical rafting houses on the waterway and nearby paddy fields (Appendix 1D-1) (RamaV, 1933). The area along the Sanseab waterway expanded considerably with the cultivation of paddy fields during King Rama V-VI's promotion of food production (Section 4.5). Many rice mills were subsequently established along this waterway, including those in the Minburi neighbourhood (TPD, 1997a).

In 1905, King Rama V issued an order to preserve and maintain the Sanseab Canal for commercial support, transportation, and irrigation. Three irrigation watergates were built in this waterway: Phratu Nam, Bangkanak, and Thakai, helping economic activity to occur as a result of settlement and water transportation (Nopkhun and Thadaniti, 1982). Many markets sprang up along this waterway, both on boats as people paddled to exchange products and in the residential areas built along the waterway (EP-03/09/10) (Appendix 2F-2).

Many roadways were built in the city during its modernisation phase (Section 4.6.1), including Sukhumvit Road, which ran alongside the Sanseab Canal in 1936. The Petchburi Tad Mai Road

was built (1962-1965), featuring numerous bridges crossing the river to facilitate street transit at Nana, Asok, and Akamai (Jiarakul, 2016). The Sanseab Canal underwent significant changes during rapid urbanisation (1950s) (Section 4.6.2). During the economic booms (1980s), uncontrolled urban sprawl led to dense inhabitation and development. The inner Sanseab Canal was embanked in 1983 to protect against erosion (RE-05/EP-09). The Sanseab Canal has played an essential role in the city's flood management, as the waterway connects two main rivers: the Chao Phraya and the Bangpakong. Watergates, pumping stations, and embankments help control water flow and maintain the drainage function of Sanseab Canal (DSD, 2007, DSD, 2020a) (Section 4.4) (Fig 4-34).

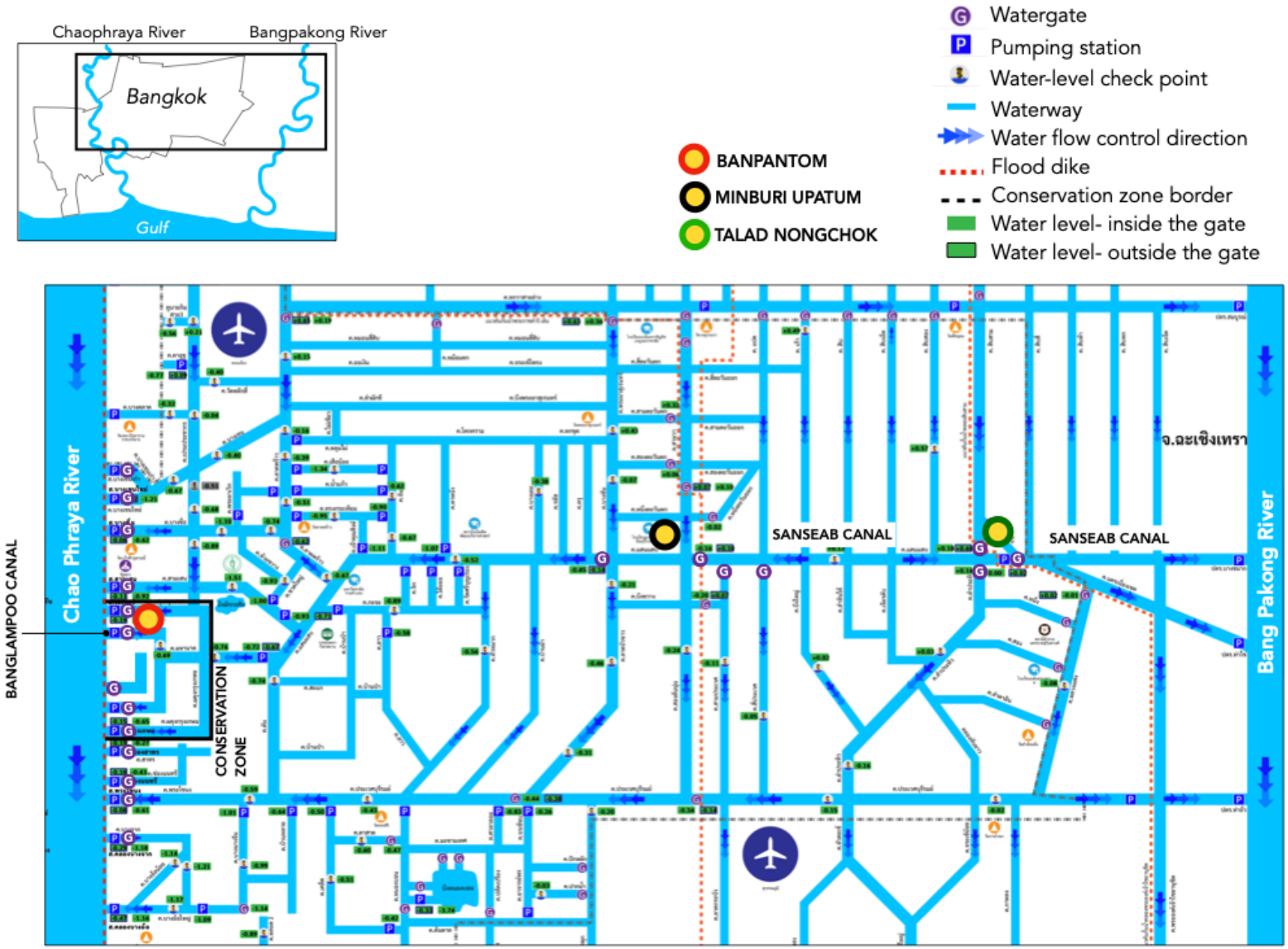


Fig 4-34 The diagram flood management map showing the structure measures in the eastern Bangkok waterway, adapted from https://weather.bangkok.go.th/KlongMap accessed July 2022

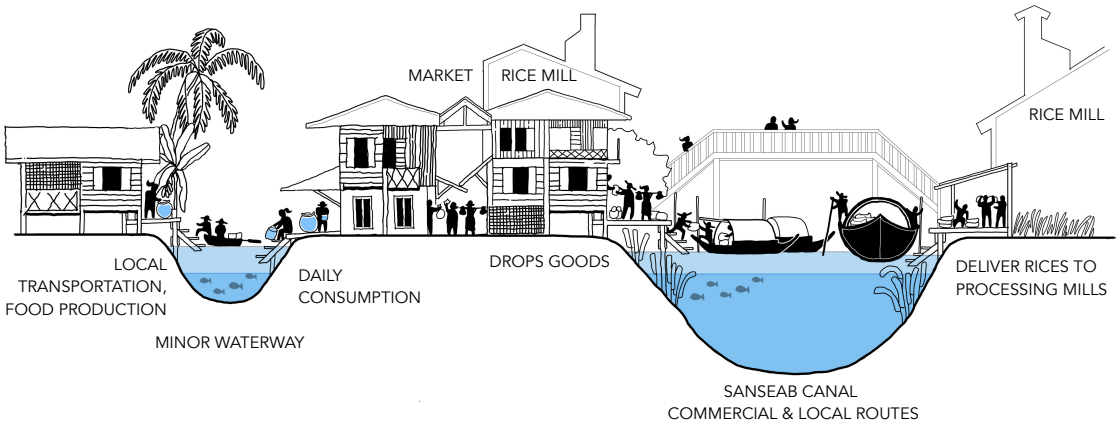


Fig 4-35 Historical overview of the minor waterway in Minburi community, and the Sanseab Canal

The Minburi Area was formed as a Province in 1901 (*Min* = Fish, *Buri* = city) following the growth of food production and trade (Section 4.5.2). In 1930, following King Rama VII's command to preserve town management amidst low trading prices for rice, Minburi Province merged to become part of Bangkok. Around 1911, Minburi became a commerce node after the period of 1782-1915. Situated at the intersection of three interconnected waterways (Sanseab, Songton Noon and Samwa Canal) (Fig 4-37), Minburi Upatum was a common overnight stop for traders or boat transporters before continuing to Rattanakosin the next day (Fig 4-35/36) (TPD, 2020b). The community served as a market with transport node between 1937-1957 (RE-04/06). The settlement also supported food production activities, with several rice mills in areas, including two of them in Minburi Upatum (Fig 4-37).

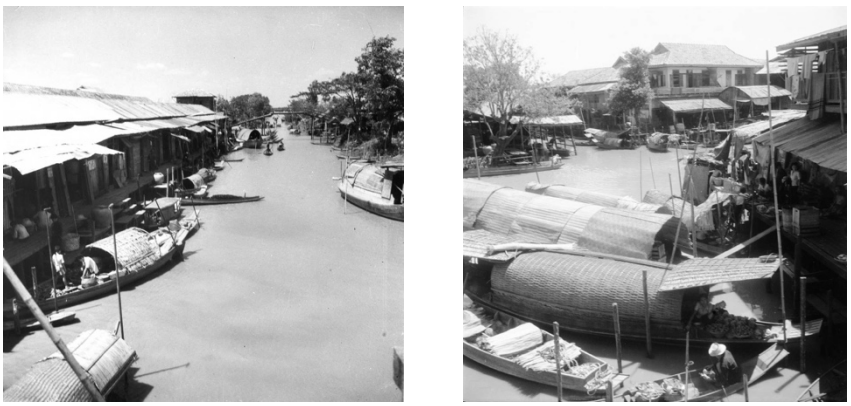


Fig 4-36 Minburi 1948: note the wooden bridge at rear of photograph (Left), the intersection of the Sanseab, Songton Nun, and Samwa Canal (Right) (Pendleton, 1957)

From 1915 onwards (Section 4.6.1), as transportation habits changed from water-based to street-based, Ramkamheng Road was built close and parallel to the canal in the 1960s to kick start development in this area following other street constructions (EP-10). Many initiatives and developments subsequently took place during the rapid urbanisation (1950s) (Section 4.6.2) and economic boom (1980s). The commerce activity in Minburi Upatum saw a

significant decrease around 1987 due to reduced demand for transportation by boats (EP-01/03,RE-04/05).

Projects related to waterways, previously related to irrigation and agriculture, now also provide flood protection following recommendation after the 1982 flood. The Royal DikeProject of 1985, aimed at flood management (Section 4.4), resulted in the Minburi Upatum area being enclosed within the flood dike, thereby becoming a protected urban area (Fig 4-23).

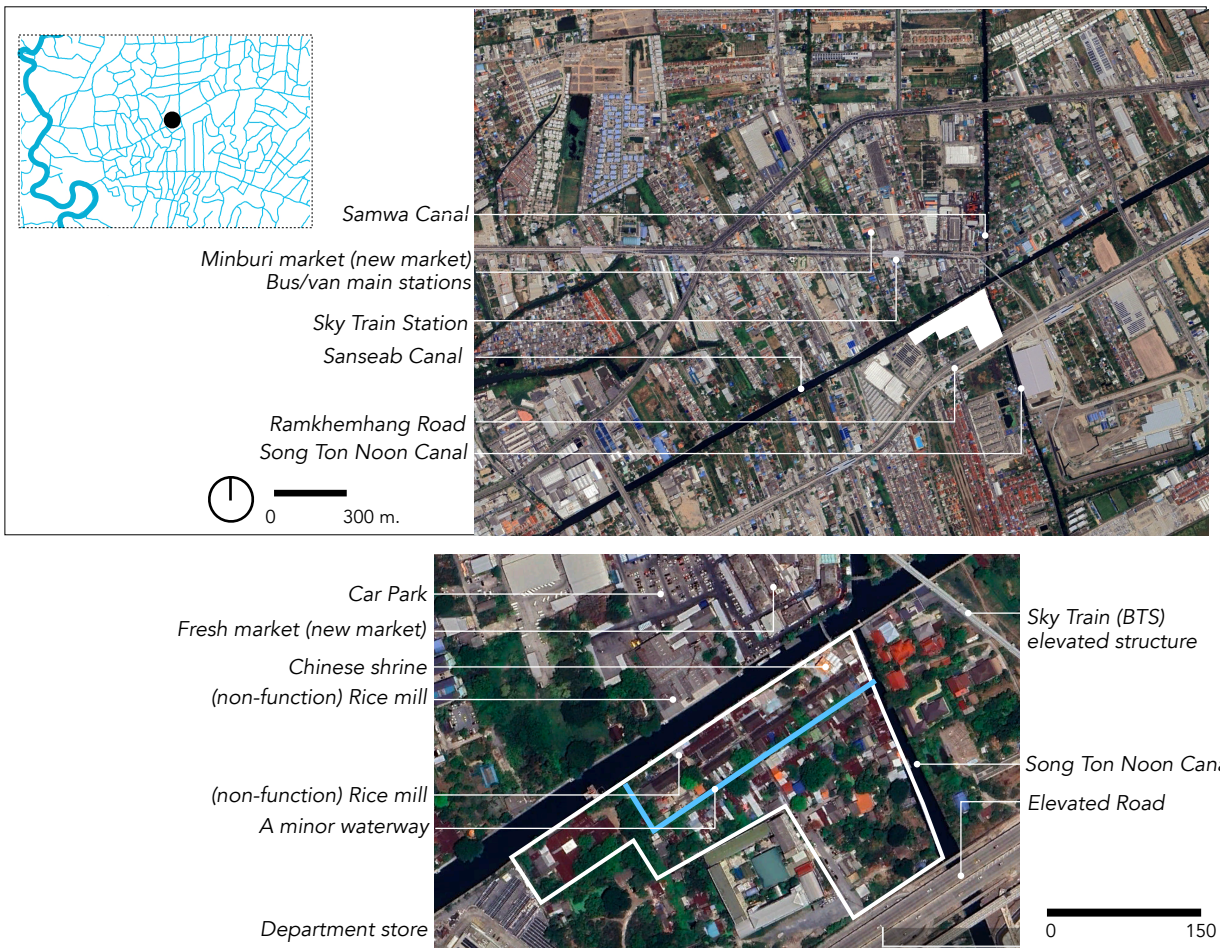


Fig 4-37 Minburi Upatum Community, adapted from Google Maps, accessed 2023

The Minburi District as a whole was not considered in the Greater Bangkok Plan in 1960 and 1971 (Fig 4-24 Section 4.6.2). It was not until the comprehensive plan of 1992 by TPD (Fig 4-25 Left) that Minburi District was included in Bangkok's area.

The water in the waterway became polluted during the urbanisation period (Section 4.6.2) (1950s onwards). This long waterway has never been clean since. In 1995, the Princess journeyed by boat across the Sanseab Canal to encourage improved water quality. This influenced the management for a while, as the agencies regulated rubbish pickups (RE-06/EP-03).

In 1996, a large fire engulfed the community, destroying some of traditional residences. The location of the fire (a house) was recently torn down and converted into a shared space (RE-05/06). At the same time, in 1996, the Bangkok Governor established the strategy known as 'Paradise Bangkok' to beautify the city, which continued until 2000. This policy included constructing embankments along BUW to enhance city views, including those along the Sanseab Canal (RE-05/06/07).

In 1997, the Redevelopment Plan of Minburi District was researched by Silpakorn University and owned by the TPD. The policy document outlined initiatives aimed at extending the city's area. Regarding waterways, the proposal focused on redevelopment to enhance water transportation, drainage capabilities, and water quality. Areas adjacent to waterways were designated for public access, including pathways, bike lanes, and flood barriers to prevent urban inundation (TPD, 1997b Page 29) (Appendix 2I-1).

In 2008, the DSD initiated the construction of an embankment along the Sanseab Canal in the Minburi Area to promote neatness and orderliness along the waterway, including the addition of a dedicated walkway. The embankment project was started but subsequently halted due to budget constraints in construction. Following the floods in 2011, the Minburi Upatum Community completed the embankment construction along the waterway in 2017 (RE-05/06/07).

In 2014, the redevelopment of Minburi District was researched under the proposal of the TPD, carried out by contractor Wisut Business. The plan maintained its focus on sustaining the growing population and development. A significant aspect of the study was the extension of rapid transportation, namely the BTS sky train, to support the area as transportation hub. This study's proposal regarding waterways emphasised the preservation of minor waterways for drainage purposes (Appendix 2I-2) (TPD, 2014).

In 2020, a third research initiative aimed at supporting city development in this region was conducted. The Minburi District and its surrounding Special Policy were led by the TPD and contracted to PSK Consultation and Chan Consultation Companies. The initial policy focused on changing land use to high-density residential to align with development goals and facilitate Skytrain routes. At the community scale (Appendix 2I-3), the proposal aimed to transform the Sanseab Canal area by creating green recreational spaces, developing efficient walkways and piers for transportation, and enhancing overall infrastructure. Simultaneously, it sought to support eco-tourism by revitalizing the Minburi Upatum Community and the old market along the Sanseab Canal, with initiatives to improve walkways, direction signs, lighting, and universal design for seamless tourism routes (TPD, 2020b).

Very recently, a policy called **The Reclamation of Sanseab Canal by ONWR** has been initiated with the main vision of restoring a healthy ecological system over an 11-year period (2021-2031). The five primary goals include: water quality, water transportation, landscape improvement, improving encroachment issues, and improving canal management (ONWR, 2021). Their translation to the action plan includes tasks like reordering and constructing structural measures such as embankments and water treatment plants (Appendix 2A-3). The water transportation route to the Minburi has conducted a test trial since 2021 to support

TOD, following the 2020's comprehensive plan (draft) by TPD and this ONWR's plan. One of the public piers is located in front of Minburi Upatum (TPD, 2014).

The development of water treatment plants in Minburi has been ongoing in accordance with this ONWR's plan, with the DSD overseeing the process. Massive pipes with a diameter of 1,000 metres are constructed below the Sanseab Canal in the Minburi Area, preparing for the piping system on both banks of the canal (Appendix 2I-4). This construction aims to improve the quality of the Sanseab Canal by diverting effluent from the Minburi Area to the treatment plant (DSD, 2020b, ONWR, 2021).

4.9 Talad Nongchok Community

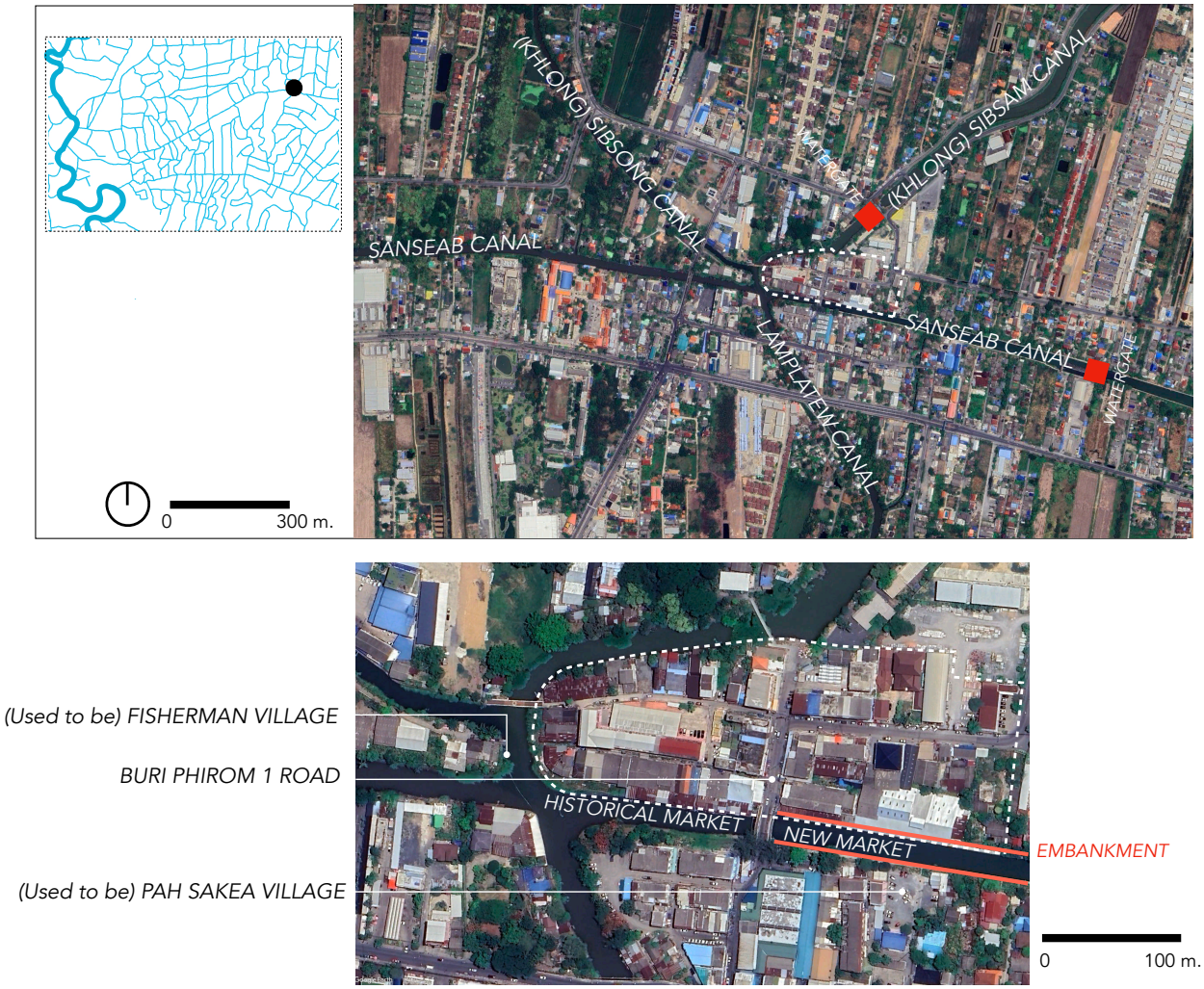


Fig 4-38 Talad Nongchok Community, adapted from Google Maps, accessed 2023

Since the Sanseab Canal was excavated in 1837-1840, the area at Nongchok had not been considered to be formal settlements, despite the number of Chinese and Muslim settlers living throughout the area (EP-09/10). The Muslim immigrants preferred to dwell along the waterway and engage in farming, whereas the Chinese immigrants preferred to trade (RE-08/09). This neighbourhood had a fisherman village located along and on the waterway's

surface as the rafting community (RE-08/09). They made their home near the confluence of four waterways: Sanseab, Sibsam, Sibsong, and Lamplatew (Fig 4-38) (Silrattana, 2015).

In 1885, there was a record of a boat transportation in the Sanseab Canal called Nai Lerd (the name of the investor)- white-boat. This white-boat link in the Sanseab Canal began in the Phratu Nam or inner part of the Sanseab Canal and continued through Mahanak, Minburi, NongChok, and to ChaseangSao (Fig 4-39) (NLPH, 2017).

During 1904-1910, the watergate at Phratu Nam, Shra Patum was constructed to support irrigation and was positioned where the white-boat route halted (Nopkhun and Thadaniti, 1982) (Fig4-29 Left), including the routes to the Nongchok Area (EP-03/09). Together with the street-based development in the modern city (1915 onwards) (Section 4.6.1), the use of water transportation declined (Jiarakul, 2016).

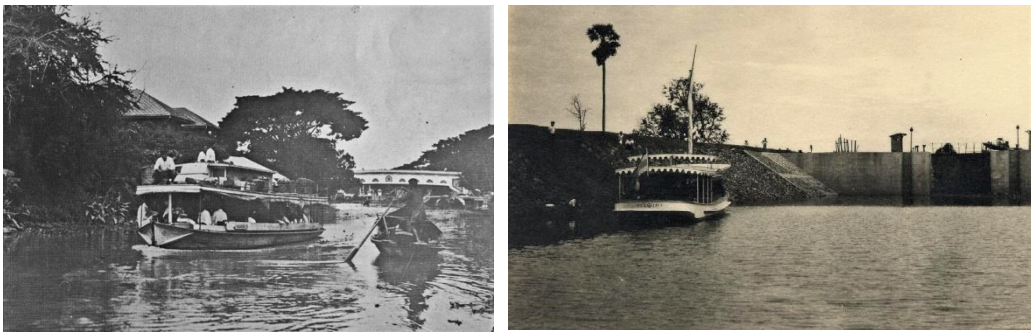


Fig 4-39 The white-boat in Sanseab Canal with Phratu Nam and Chaleam Lok Bridge at the back of the photograph (Left), the white-boat and watergate called Tha-Kai in Chachengsao (Right) Source: https://wikicommunity.sac.or.th/community/244 accessed July 2023

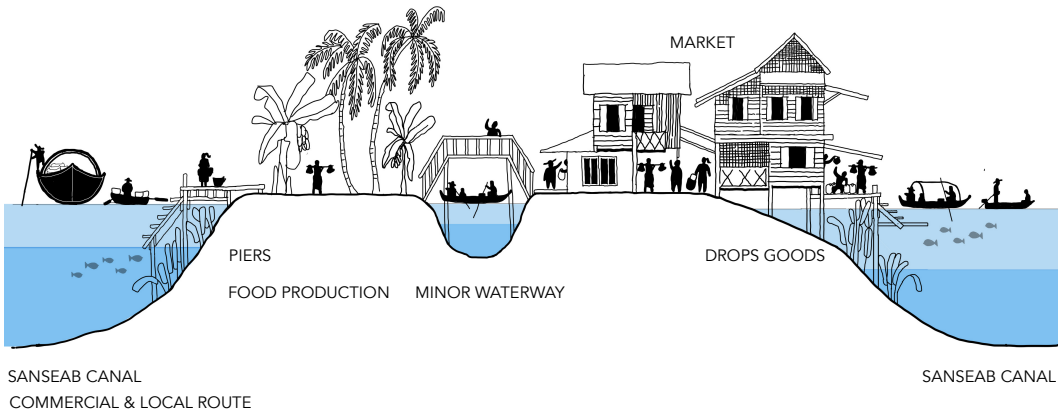


Fig 4-40 Historical overview of the minor waterway, Sanseab Canal, Talad Nongchok

During the modern city era (Section 4.6.1), Nai Lerd, the investor, owned a large portion of the land along the Sanseab Canal, including Talad Nongchok (RE-08/EP-09). He invested the area into a market (Fig 4-40) and established a leasing business for Chinese immigrants (Fig 4-41) (NLPH, 2017). The study site was historically an island divided by surrounding waterways (Fig 4-38). As other areas in this neighbourhood were divided under different ownership, they provided various functions supporting market activities (Fig 4-40/41). There was a record of

a Chinese School formed in 1917 by the locals to teach their children the Chinese language (Silrattana, 2015).



Fig 4-41 Nongchok neighborhood with markets activities and the water transportation provided (refer to 1910s) (Silrattana, 2015).

Nongchok was not in the Bangkok boundary according to the Greater Bangkok Plan of 1960 and 1971 (Fig 4-24 Section 4.6.2). Instead, it was incorporated into the province of Cha Chengsao and received assistance from the Provincial Agriculture Agency due to its abundance of paddy fields (EP-09/10). The area was included in Bangkok from the comprehensive plan of 1992 onwards (Fig 4-25). Furthermore, the Royal Dike or flood barrier (Section 4.4), constructed in 1985, divided the area to separate the agricultural land from the urban area, protecting the denser residential sector from flood damage (Kunti, 2014).

A fire incident in 1986 that destroyed the southern market and the residential area along the Lampla Tew Canal (Fig 4-38) (RE-08/EP-09). Shortly after the fire, the importance of Nongchok's proximity to markets and transportation hubs diminished, relegating it to the outskirts among paddy fields (Silrattana, 2015). Despite Krobkru Kongsong beginning boat transportation in 1990, access to the Nongchok area was barred. Public boat transport was only offered within the inner city. The waterways in the Nongchok area became primarily used for irrigation and food production (GA-03).

In 1997, the TPD processed the Redevelopment Plan for the Nongchok District, researched by Silpakorn University. This document considered preserving the agricultural area as a floodway, developing streets, proposing water transportation, and preserving the neighbourhood's identity (TPD, 1997b) (Appendix 2J).

The urbanisation and unplanned growth in Nongchok (Suksawang, 2012) since the 2000s transformed the landscape from paddy fields and villages to housing developments and flats. The shift was driven by changes in land ownership from residents to investors (EP-09/10). The resulting housing pattern, catering to lower-income individuals unable to afford inner-city prices, reflects the choices of people who moved to Bangkok for work, opting for suburban living over the city centre due to growing urbanisation (EP-01/03). As a result, the land use in

the Nongchok District has become a mix of local communities and new immigrants within the housing complexes (Silrattana, 2015).

There was a forced land use pattern change that caused the disappearance of local communities, such as the little village of Pah Sakea, which was located to the south and along the Sanseab Canal, opposite the Nongchok new market. Locals were compelled to relocate as the surrounding areas evolved into apartments and townhouses. The entire communal area was demolished and replaced with a parking lot (Fig 4-38) (Silrattana, 2015).

Around 2005, a policy was implemented to promote the construction of a flood-protection structure. The watergate at the outskirts of Bangkok near the study site were designed with 20 pumps to support the diversion of water in the event of a flood (RE-08/09) (Fig 4-38). The large construction project to extend lanes of the roadway parallel to the Sanseab Canal began around 2005, took a long time to process, and was completed around 2014 (RE-08/09/10). This project originated as part of the Redevelopment Plan of Nongchok District, owned by the TPD and studied by Chulalongkorn University (EP-02/07). However, the implementation was not related to the study document (RE-08/09/10) (Appendix 2J-2).

Between 2017-2020, there was a massive embankment construction led by the DSD along the Sanseab Canal at the edge of Eastern Bangkok (Section 4.4). The construction area included the Nongchok watergate, extending to the end of the Bangkok boundary, and the Nakornnengket Canal, including the Sanseab-Luangpenk Canals (DSD, 2012, DSD, 2020a).

In summary, the three waterway communities have a long history and distinct management actions, each contributing to their changing landscapes in different ways. Banpantom, a historical artisan village along the Banglampoo Canal, is prioritised for protection and water cleanliness. Minburi Upatum, once a commercial hub with the Sanseab Canal as a transportation route, has transformed into a dense residential area supported by urban development policy. Talad Nongchok, a local market on Bangkok's outskirts, relies on the Sanseab Canal for irrigation and has an ongoing floodwall project. The next chapter will outline the empirical findings from these three communities.

Chapter 5
Bangkok Urban Waterway, landscape change and stakeholder values

5.1 Introduction

This chapter calls directly on interviews with stakeholders GA/IA/EP/RE, addressing the research question (RQ) focused on "landscape change" and "landscape value". Section 5.2 focuses on understanding the changes in BUW, including processes driving these changes and how these changes are related to management practices (RQ 1.1/1.2). Section 5.3 explores the government process of managing BUW to illustrate the challenges (RQ 1.1/3.3). Section 5.4 moves to describe desirable management from the perspective of different stakeholders as collated in the interviews (RQ 2.1). In Section 5.5, the focus shifts to describe the changing landscape value of BUW, including the differentiation of values held among stakeholders (RQ 2.1/2.2). Section 5.6 examines the interrelationship between value demonstrated through policy strategies and stakeholder recommendations (RQ 2.1/2.3).

5.2 The Bangkok Urban Waterway's alteration

5.2.1 Structure and illegal encroachment

Resident interviewees (RE) stated that the waterways were historically wider than they are today (RE-02/06/09). RE from Banpantom described a roadway built on top of the Banglampoo Canal's bank. This pathway running alongside waterways is presented with the constraints imposed by the historical bridge (RE-01/02/03) (Fig 5-1-Left/Fig 5-6).

> *"Before the construction of this roadway, my house used to be the arrival and departure point for boats because there was a terrace in front of the houses, adjacent to the waterway. After that, the roadway or dam was built on top of the bank. They [GA] constructed a footpath and railing along the waterway later on. […] The bridge is still there. The canal was much wider more than it is now." RE-01*



Fig 5-1 Historical bridge overlapping on the renovation of walkway along Banglampoo Canal (Left), Walkway with embankment along Sanseab Canal in Minburi Upatum (Right)

In Minburi Upatum, the Sanseab Canal is equipped with an embankment featuring a walkway alongside the bank, narrower the waterway (RE-05/06) (Fig 5-1-Right). A flood dike is erected along the Sanseab Canal in Talad Nongchok, replacing the natural bank (Fig 5-2 Left); however,

with incomplete (Fig 5-2 Right) and certain sections of the structure severely broken in 2019 (Fig 5-17/22) (RE-08/09/10).



Fig 5-2 The flood dike (Left), an improper structure of embankment along Sanseab Canal in Talad Nongchok (Right)

Expert interviewees (EP) described how this embankment encroaches upon the waterbody or replaces the bank's area due to the presence of private properties located adjacent to the waterways, leaving no more space in public ownership (EP-03/05/09). After the construction of these measures along the waterway's area, the previously ambiguous boundaries of the waterways' banks are eliminated as the bank area effectively disappears (EP-01/09).

> *"As everybody has their own deed and the government cannot interfere with the land belonging to the residents. So, they construct the structure in the canal instead." EP-09* (see Fig 5-6)

EP described that minor waterways serve as a prime example of where construction activities often cover over a significant portion of the waterway to create additional floorspace (EP-02/03/05/10). RE in Talad Nongchok described the street, Buri Phirom 1, which covered the old minor waterways (RE-09/10) (see Fig 5-5).

> *"They [the minor waterways] functioned as the alley or the Soi or the small private street. They normally got smaller because of the encroaching. Mostly, the housing estate filled them and turned into properties." EP-10*



Fig 5-3 The residential settling in Sanseab Canal's bank before 2019 (Left)
Source: https://www.facebook.com/p/ตลาด-100-ปี-หนองจอก- accessed September 2021,
Some of the houses being removed from the Sanseab Canal's bank (Right)

Government agency interviewees (GA) described illegal encroachments by residents who have occupied the waterway's bank, using it as an informal settlement, including in Talad Nongchok (GA-01) (Fig 5-3 Left). They described that the encroached area was initially intended to be a public space or a setback from the buildings along the waterway (GA-01/04) (Fig 5-2 and Fig 5-3-Right) (refer to Section C).

5.2.2 Building reorientation

EP reviewed that reorientation of buildings happens where the buildings' position or orientation is altered, shifting them from facing a particular direction to now facing another, mainly towards the roadway (EP-03/09/10). RE from Banpantom revealed that the shift in settlement resulted in the canals becoming essentially inaccessible backyards due to city and tourist developments in the areas (Appendix 3A) (Fig 5-4 Right) (RE-01/02/04).

> *"There used to be sawmills and shipyards along the Banglampoo Canal, which are now being removed as the canal's function comes to an end. [...] The transition from a crafting village facing the canal to one with vendors facing the street has caused the Banglampoo Canal to become the back of the buildings instead." RE-02*



Fig 5-4 A non-function rice mill in Minburi District (Left), Banlampoo Canal being the backyard of the buildings (Right)

In Minburi Upatum, RE described the closure of market activities and their relocation to Singhaburanakit Street with a new layout. There were new investors and different groups of merchants involved, marking the end of traditional rice milling (Fig 5-4 Left) (RE-05/06/07).

In Talad Nongchok, RE described their settlement change from local markets to townhouses. The accessibility of the old market underwent reorientation as the street became the primary means of access (Fig 5-5). The wooden mill stopped importing wood via water transport; the expensive wooden planks and the availability of alternative materials were among the causes. Recently, owners have adopted artificial wood and built a street, Buri Phirom 1, over the minor waterway for factory and new townhouse access (RE-08/09/10).

> *"My shop used to be at the end of the alley but now it is at the entrance to the alley as the street - Buri Phirom1 - [perpendicular to the alley] has become the market access point." RE-09*

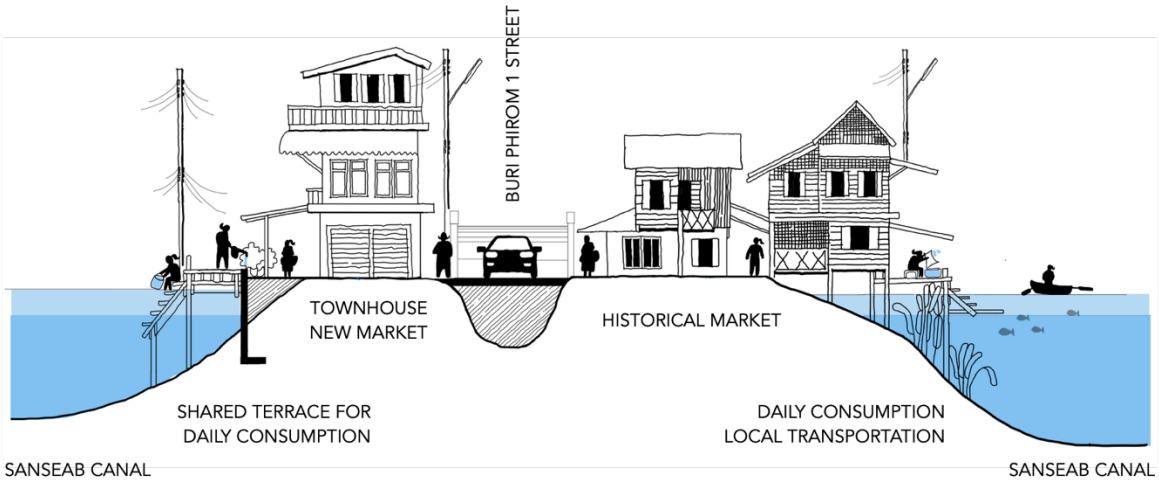


Fig 5-5 Talad Nongchok during the city's development

GA/IA/EP shared the same opinion about this type of change. Reorientation is not only a matter of settlements turning their backs to the waterway; the process is considerably more involved than that. Erecting fences along the waterways in the dense urban area also implements a complete separation between residents' backyards of and waterways (GA-01/04/IA-08/EP-02/05/06).

5.2.3 Ownership and boundary changes

EP highlighted that the timeframe for the deed registration influenced the recent justification of locals' rights. Almost all major waterways in urban areas have paved embankments providing a flat and smooth surface for public access, according to the required neatness and orderliness of the Governor's policy (EP-01/03/06). EP described this as one of the strategies to return the ownership to the public.

> *"The goverment authorities give the reasons they want to create public areas that belong to everyone, not specific for some people. The neatness and orderliness have embedded through the change of waterway's area since the Old Town management." EP-03*

RE clarified the landownership in Banglampoo Canal and the surrounding community area, detailing the ownership and boundaries of the waterway. They referred to Parinayok Street, a roadway or dam constructed in the 1970s, which has been designated as public property and is maintained by GA (RE-01). Since then, ownership has been clearly defined, and locals no longer have any rights to that area (RE-01/EP-04/05) (Fig 5-6).

RE described that the area has been managed and a focus on reordering street vendors. Local merchants were asked by DIO to relocate and manage their equipment, such as carts, to prioritise cleanliness and public appeal for tourists (RE-01/03/04).

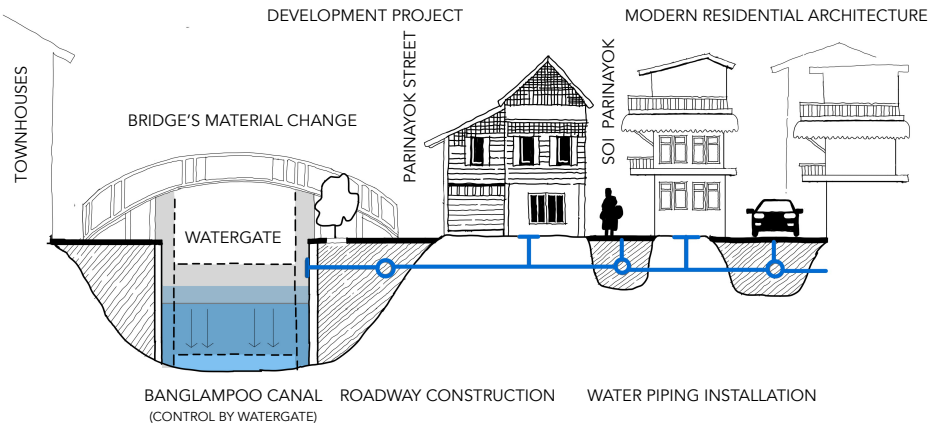


Fig 5-6 The Banglampoo Canal and Banpantom during the city's development

EP presented a complicated chronology and defined the communal rights of Minburi Upatum. A private investor officially held the area during King Rama V's reign and later donated it to the National Office of Buddhism (NOB) (EP-01/03). The rental payment process was ambiguous, leading to unclear ownership of the community. RE in Minburi Upatum said that although the Drainage and Sewerage Department (DSD) is responsible for the Sanseab Canal, no one formally cares the area adjacent to the waterway including community's area (RE-05/06).

> *"We are in the grey position of being an encroached but legal settlement. We cannot request maintenance for the area because we do not own our properties. I have lived here, and my family paid monthly rent until the owner of the properties disappeared, leaving us unsure of whom to pay." RE-06*

RE in Minburi Upatum mentioned that the public access and ownership resulting from the construction of embankments with walkways along the Sanseab Canal unexpectedly encourages intoxicated and inebriated individuals, including strangers, and criminals, during nighttime (RE-05/06/07).

> *"In our community, houses locate along the walkway have experienced robberies during nighttime since the construction of the walkway. This is because strangers passing by can easily access our houses. Before the walkway was constructed, we never had these troubles." RE-07*

RE in Talad Nongchok said that they used to rent the area before the entire market was purchased and turned over to them. They owned the land as a shared collective, including the canal's bank, after gaining individual land/property ownership. However, the historical market properties located along the Sanseab Canal's bank have no deeds despite their originally shared collective ownerships (RE-08/09/10) (Fig 5-3 Left).

RE described that regulation of deed registration has made it illegal to build anything on the waterway's bank. This has led to controversy over the flood dyke at Sanseab Canal in Talad Nongchok due to the lack of clarity in identifying the waterway's bank owners (RE-08/09).

"When we bought the land and got the overall deed, we went to the Land Department, requested to separate the deed, and to make the official residential addresses for each house. […] Everybody had their own deeds except the houses at the waterway's bank, but they got the house registration or address. […] The DIO knew that we existed with legal residential status. One day, they [GA] told us we cannot live here." RE-09

5.2.4 Waterways are controlled or disappear

EP described how major waterways – canals and rivers – are controlled using water gates and pumping stations, while minor waterways – *Lamrang* – have largely been covered and vanished, often transformed into paths (EP-01/02/03/04). They described how minor waterways have also been substituted by underground pipes (refer to Fig 5-6). Additionally, some waterways were culverted underground to serve the streets or bridges instead.

"The watergates at the historical canals have been converted into pumping stations, preventing boats from passing through. These gates are permanently closed, disrupting the flow of water from the river to the waterways. In the case of the Sanseab Canal near Minburi, a watergate was installed in the middle of the canal after the construction of the King Dike." EP-02

In Banpantom, RE described that the waterway has undergone changes due to the installation of a watergate, leading to consistently low water levels and the cessation of tidal influence from the river (RE-01/03/04) (Fig 5-7). Minor waterways that once existed within the community have been covered and transformed into concrete alleys (Fig 5-8), and some remaining waterways have been fragmented (Fig 5-10 Right).

"Here [Fig 5-8], the waterway was Khlong Bann Lor before and connected to other networks of canals, then flowed to the Chao Phraya River at Phraram VIII bridge. […] The water level [in Banglampoo Canal] is always very low because the watergate never lets the water flow here. It normally rises very slightly in the sixth until eighth months [June-August] because of the rain". RE-03

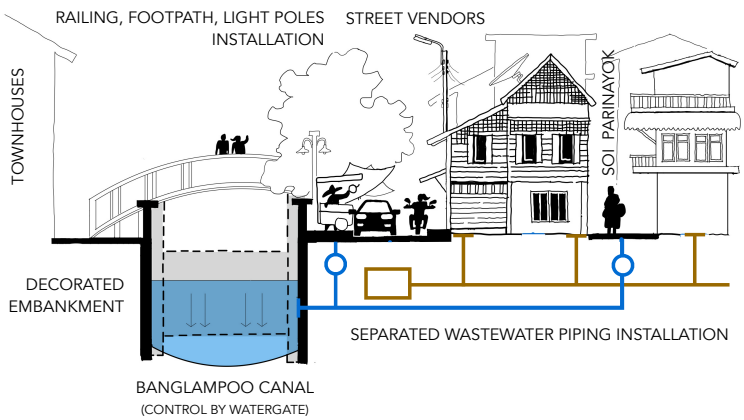


Fig 5-7 Recent overview of the Banglampoo Canal and the community



Fig 5-8 The alleys used to be the minor waterway (Left), and networking to the River (Right)

In Minburi Upatum (Fig 5-9), the Sanseab Canal has been subject to control through the use of the watergates (RE-05/06/07). EP said the previous water flow from the eastern direction has been halted. They also explained an example of regulating the water level in the Sanseab Canal to allow boats to pass under a bridge. Additionally, the waterway network north of the Sanseab Canal has been controlled to prevent southward flow, serving the agricultural area (EP-02/03). Within the community, RE showed the minor waterways which have been disconnected from the Sanseab Canal due to embankment construction, resulting in blocked water flow (RE-05/06) (Fig 5-10-Left).

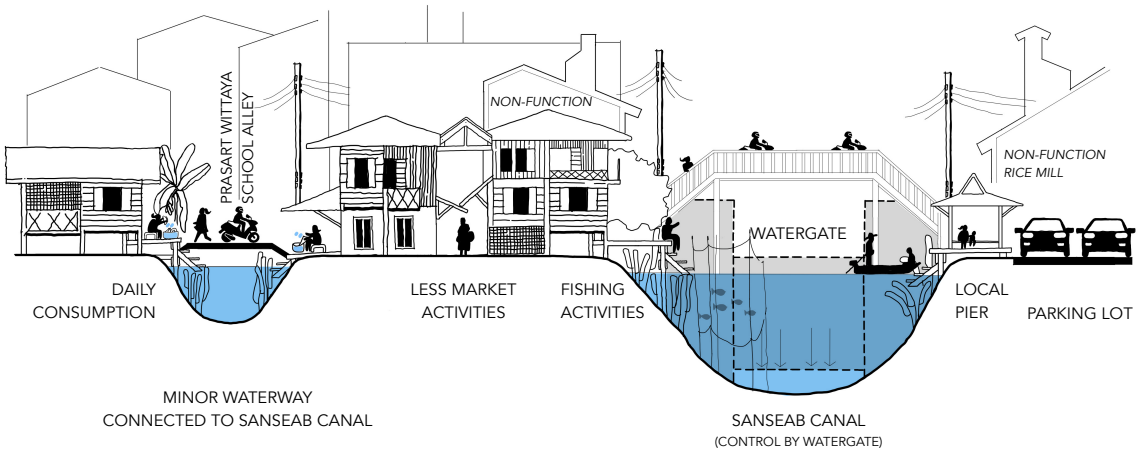


Fig 5-9 Minburi Upatum and Sanseab Canal during city development



Fig 5-10 A minor waterway used to connect to Sanseab Canal (Left), a minor waterway used to run around Parinayok Temple through Banblampoo Canal (Right)

"This Lamrang [minor waterway] used to connect to the Sanseab Canal, allowing water to flow out into it. Recently, it has changed to a sewage channel because residents throw the organic trash in it, and the water has no way to flow. I cannot imagine how we used to paddle our boats through this Lamrang in the past." RE-05

Interviewees described the usual flow of water in the Sanseab Canal in Talad Nongchok from east to west. This direction has altered through control by pumps, diverting the flow towards the east or outside Bangkok (RE-08/09/EP-02).

"The 20 pumps at the watergate [Sanseab Canal] were constructed during the tenure of Bangkok Governor Apirak Kosayotin [2004-2005], when many pumping stations were established around Bangkok. […] The water [in Sanseab Canal] has been diverted from inner Bangkok through here". RE-08

5.2.5 Poor water quality and absent biodiversity

Interviewees described that the Banglampoo Canal had poor water quality due to the dense urban environment. However, there has been an improvement in water quality because of enhancements made to the treatment system and the establishment of a conservation zone (Fig 5-7) (EP-03/GA-06/07). While water quality tends to be better, people are prevented from gaining such benefits from the canal, i.e., fishing in the canals is prohibited due to the merit place (prevent the act of causing harm or death to animals) (RE-01). Interviewees also described that Banpantom no longer possesses a natural cycle (RE-02/EP-04/05).

In Minbiri Upatum, the waterway no longer serves as a thriving habitat for aquatic life, very different from its historical status as a fish city (EP-01/03/09). The Sanseab Canal's bank has been replaced by built structures (EP-03/04) (Fig 5-12/11-Right). The presence of trash from residential areas, untreated wastewater discharge (see Fig 5-13-Right), and reduced oxygen levels caused by stagnant water flow were discussed by RE (RE-05/06). EP described that non-native species are often found in the canals due to traditional activities of releasing non-native fish into the waterways.

"The waterways that used to have Lampoon or Crok Tree and aquatic plants: Elephant Ear Tree, Papyrus, etc. […] When the natural soil bank disappeared, the small fish, small organisms… could not survive, [and] there are now only the non-native animals such as Sucker Fish which survive in the low water quality." EP-06



Fig 5-11 Minburi Upatum: Sanseab Canal before the embankment construction (Left), An embankment along the Sanseab Canal (Right)

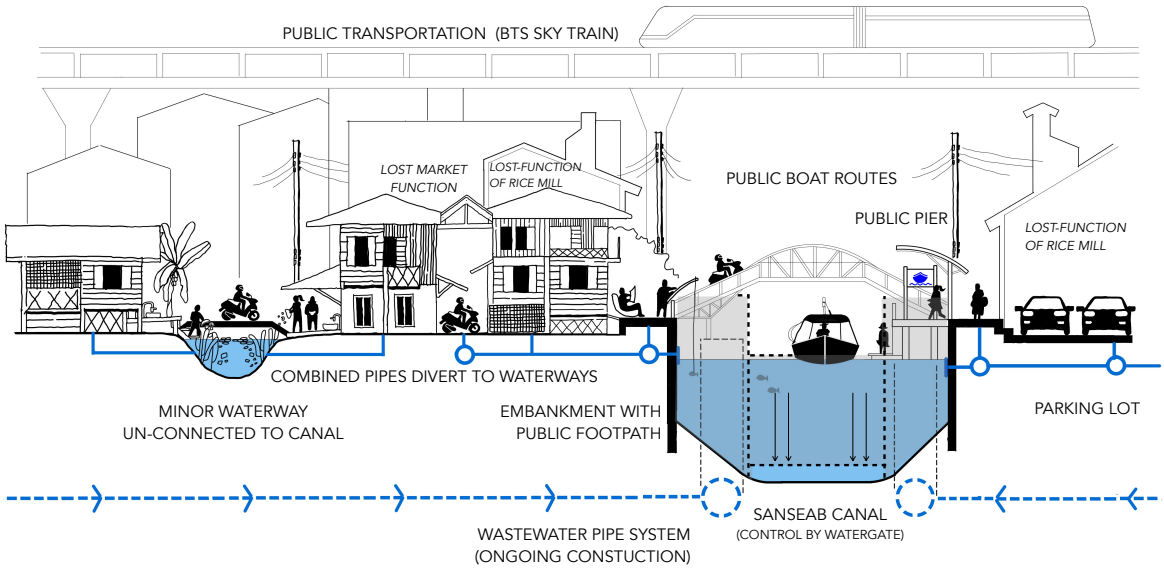


Fig 5-12 Recent overview of the minor waterway, community, and the Sanseab Canal

RE in Minburi Upatum demonstrated that despite the ongoing project of wastewater plants and piping improvement in Minburi District (Fig 5-13 Left) (Chapter 4), their houses (Fig 5-11) are too old to be equipped with modern piping structures, resulting in irrelevant outcomes for the community area (RE-05/06).



Fig 5-13 Construction of piping under Sanseab Canal (Left), Low water quality (Right)

In Talad Nongchok, RE explained that the management of the banks along the Sanseab Canal used to be done by individual house owners, using materials such as wood or concrete, to protect against erosion (Fig 5-14). When the administration implemented a high embankment flood dike, the natural bank disappeared (Fig 5-1 Left/5-17-Right) (RE-08/10).

The area has also seen a significant decline in water quality, primarily due to wastewater discharged from households and the estate projects, and the lack of proper water flow within the water body (RE-08/EP-02/09). The construction of residential projects has often covered existing minor waterways, causing blockages to water flow (RE-10/EP-02/03). EP described the absence of a separate water treatment system, resulting in alterations to the waterways in many neighbourhoods as the city gets denser (EP-05/IA-08).




Fig 5-14 The local's embankment protecting erosion along Sanseab Canal

5.2.6 Diminished accessibility and visibility

The accessibility to Banglampoo Canal is absent in Banpamtom, which there used to be a wooden terrace offering access to the waterway (RE-02/03/04). The pattern of the terrace has disappeared and been replaced by a roadway/dam construction due to a conservation project, which prevents access to the waterway (Fig 5-15). This has caused difficulties during the Loykratong Festival (RE-01/02).

> *"We just passed the Loykratong Festival in December and faced very difficult conditions because we could not access the water. We hung our baskets over the canal to allow our Kratong to float on the water's surface. […] We have done this every year since they constructed this long railing." RE-02*



Fig 5-15 The embankment with no accessibility to Banglampoo Canal in Banpantom

In Minburi Upatum, the wooden terrace access to the waterway has been replaced by an embankment and a public walkway from DSD, effectively removing any accessibility to waterways (RE-06/07) (Fig 5-1 Right). In Talad Nongchok, access to use the water from the Sanseab Canal is prevented by the high embankment by DSD (Fig 5-1 Left). Because locals still use boats for transport, they have improvised structures to overcome the high embankment for accessibility (Fig 5-18/5-16) (RE-08/09). RE also described how these structures block both views and the flow of the wind (Fig 5-17-Left) and unfortunately, some have been broken (RE-08/10) (Fig 5-22).



Fig 5-16 Stair created by local nearby Saint School in Nongchok Neighborhood



Fig 5-17 Blocked visibility flood dike in Sanseab Canal at Talad Nongchok (Left), disappeared natural bank (Right)

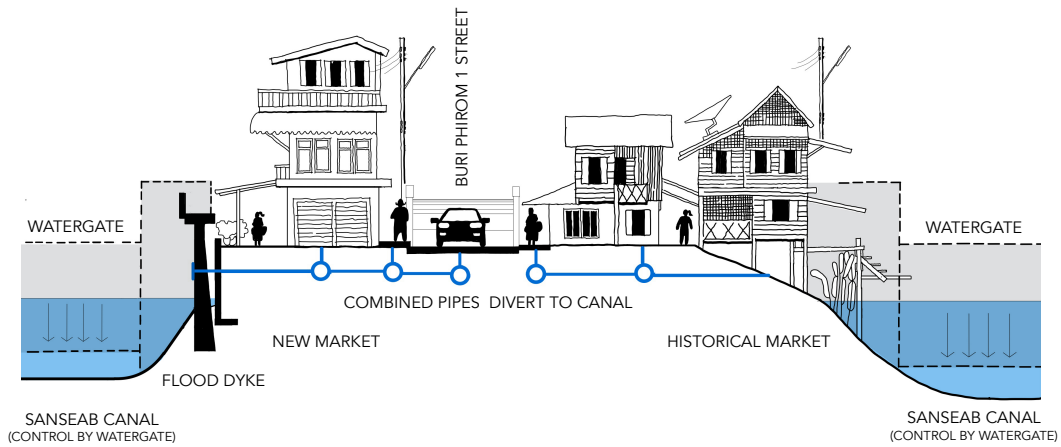


Fig 5-18 Recent overview of the Sanseab Canal and Talad Nongchok

IA described BUW as the overlooked element where they seem to be disregarded and ignored by the populace as if they do not even exist (IA-09). GA described that BUW have been viewed as fragmenting the urban layout by impeding access to surrounding areas like housing or buildings, in contrast to the easy access provided by streets (GA-02/06/07).

> *"Urban development consistently faces challenges in areas containing waterways within properties. Despite their linear layout resembling streets, waterways do not offer the same accessibility. […] The waterways in urban areas present a hindrance to proposed development." GA-02*

5.2.7 Change in impact of inundation

EP described how, before the Rangsit Project (Fig 4-21 No.8 Section 4.6.1), water meandered through the natural contours of waterways in the lower delta area. However, the construction of engineered waterways brought about a constrained path for water, leading to accelerated water flow toward the lower terrain. The current flood impact far surpasses the original topography (EP-02/03).

RE in Banpantom described how their community historically faced natural inundation during the flood season, particularly during high tides from the Chao Phraya River, but currently never floods (RE-03/04).

> *"The water historically rose and flowed through the waterways and could reach the terrace when the tide of the river influenced the water level in the [Banglampoo] canal. However, the water level lowered quickly because it flowed through other minor waterways. […] There was one time when I was in [school] [in 1975] when the flood occurred […] Nowadays, no matter how heavy the rain is, the area will never flood because they [DSD] always divert water out and keep the water level very low". (RE-04)*

RE described that in 2011 the high tide from the Chao Phraya River overcame the barrier at the riverside, but not within the community itself (RE-01/04) (Fig 5-19).



Fig 5-19 Floodwater in the Tha Phra Artit Road Banglampoo District in 2011
Source: https://www.thairath.co.th/news/local/bangkok/212568 accessed August 2023

RE in Minburi Upatum described a historical situation where water levels would rise during the rainy season, and the water remained confined within the waterways and paddy fields without impacting the community (RE-06/07). The flooding has recently begun to impact this community, as measures are being taken to prevent water from flowing into the city centre, diverting the water towards the eastern section (EP-01/04). RE described that Minburi Upatum typically experiences initial flooding annually during periods of above-average rainfall as a result of blocked waterways (RE-05/06/07) (Fig 5-20).

> *"I remember that the floods in 2011 came, we temporarily lived here [at the community's open space] because our houses were full of water. […] Some houses which have second floors, they lived on the second floor. I had to live with my grandson. […] My grandson's house is located along the canal and has two floors*

[…]. I had to put some stones under the cupboards and other furniture to prevent the water from damaging the furniture." RE-06



Fig 5-20 The flood incident in 2011 (Left) The flood incident in 2022 (Right) in Minburi Upatum
Source: https://www.posttoday.com/politics/115369 accessed August 2023

RE in Talad Nongchok described historical flood events involving a rise in water levels that surpassed the norm and reached terrace levels, but receded quickly within a short span. The area where residents reside has never encountered flooding impacts, whether in the past or more recently (RE-08/09).

Despite receiving warnings about potential impacts during the 2011 flood, the community remained unaffected by the flooding, including other years when the water level became very high (RE-08/09/10) (Fig 5-21). EP explained that because area have green spaces of paddy field and minor waterways where water collects (EP-03/04/09) (Fig 5-21).

"When the flood season came, the water level would rise high until it reached the first step of the stairs. That was the highest water-level I have ever seen. The water level remained around 0.80-1.00 meters below reaching the land. Even during the big flood in 1982, when the water level in Ramkamheng District almost reached 2.0 meters, the area here was dry […] During the 2011 flood, they opened only one pump out of 20 to divert the water. There was no water to divert, at that time, as they had tested all 20 pumps in preparation. […] Once, water flowed quickly from the north, and they operated 5 pumps to divert it." RE-08



Fig 5-21 The water-level got high during September 2022
Source: https://www.facebook.com/p/ตลาด-100-ปี-หนองจอก- accessed September 2022

5.3 Performance of BUW governance

5.3.1 Collaboration versus fragmentation

Rhetorically…

GA interviewees on water management highlighted their strong collaboration, exchanging water-related data with agencies, which aids decision-making for flood management. They insisted that their collaboration ensures effective actions, especially regarding watergate operation and showcasing synergy among water management agencies (GA-03/04).

> *"DSD controls water levels, relying on our [Royal Irrigation Department, RID] data, especially when water flows from the north. Our water level data is crucial for their decision-making. We hold meetings, share data, and have management plans in some areas. If DSD plans anything outside, they report to us. For instance, if they want to open a watergate, we decide to open other gates to prevent blockage. […] Typically, authorities in different areas maintain communication." GA-03*

> *"We [DSD] maintain ongoing cooperation with RID, forming a collaborative group that includes the Meteorological Department [MED], Hydrological Royal Thai Navy Department [HRTN], and Office of National Water Resource [OWNR]. RID oversees river deltas and coordinates with the Metropolitan Electrical Authority for dam-generated electricity. Dams facilitate agricultural production by redirecting water to lower lands for cultivation." GA-04*

Reality for residents…

RE in Talad Nongchok noted fragmented communication in watergated operations. They described how the destruction of the communication has led to low water levels and water contamination in the Sanseab Canal (RE-08/09/10). RE in Minburi Upatum addressed ineffective communication during flood seasons due to different agencies managing various gates (RE-05/06/07).

> *"In Nongchok, around 40 waterways fall under RID, while Bangkok Metropolitan Administration [BMA] oversees three. The authority for RID-managed waterways rests with DSD, and orders must come from RID. Neither the local DIO nor the DSD leader nor the Bangkok Governor can independently instruct; official command letters must be sent to RID as the national agency." RE-07*

Interviewees labelled incidents with fragmented communication, where construction and maintenance jobs are handled separately by agencies such as the Public Works Department (PWD) and DSD (see more in Appendix 3B) (EP-02/04/05).

One interviewee, with experience working in the Fine Art Department (FAD), revealed that tasks within the conservation area by BMA can occur without due consideration of policies set forth by the Rattanakosin Committee under Office of National Resource and Environmental Policy Planning (RC-ONEP). They highlighted RC-ONEP as an example of committees initially established for collaborative efforts but often duplicating the FAD's responsibilities with little

distinction between them. Moreover, the duplication of regulatory efforts in the conservation zone was described (EP-03/04/IA-08).

> *"If you want to construct any building within the conservation boundary, you need to request approval from the DIO, ONEP, and FAD. […] BMA has its own plan for the conservation area, one plan called the 'Five Districts of Conservation Plan' or Pan Anurak 5 Yan. Under this plan, nothing relates to ONEP." IA-08*

5.3.2 Informative communication

EP noted that meetings among multiple agencies often serve as a platform for sharing finalised plans rather than encouraging open discussion, making the meetings more informative than collaborative (EP-03/05). EP, involved in the Minburi Project, described that messages were relayed through the consulting team, involving only basic message exchange, and more comprehensive discussions were hindered.

> *"We, the consultation team, spoke to DSD, who suggested prohibition. DSD and TPD relayed messages through us. When we presented an alternative approach to DSD, they advised us to talk to TPD to avoid causing trouble. […] This communication process was restrictive, hindering our ability to facilitate meaningful integration." EP-01*

GA presented that they normally receive informed plans from others, mainly receiving assigned tasks rather than engaging in debates or discussions about the decisions. There are barely open discussions during the meetings. They addressed that the budget allocation process hinders the integrated agency's objectives (GA-06/07).

> *"When we [FAD] received the project details from DSD, the embankment height was already predetermined. They didn't consider the overall big picture or address the question of how to manage floods. I want to convey that we received predetermined solutions. Generally, our [GA] working process is shaped by the fact that we finalise all decisions within our agencies. This is because we request budgets based on the explicit framework with our department names only." GA-07*

5.3.3 Centralised power, political timeframes and bribery

Interviewees reviewed the action taken as the project implementation for the encroachment improvement along BUW, i.e., OngAng Canal and Ladprao Canal Projects. Despite the lengthy processes typically involved in areas within the conservation zone, these projects were implemented due to the exceptional situations during the military government (2014) (EP-03/GA-07). Interviewees mentioned that the creation of ONWR during the coup led to the Minburi wastewater management plan, which had been under consideration for 15 years (EP-01/03/RE-05/07).

> *"I've heard about this project [wastewater management in Minburi District] for a long time, but nothing happened until after the coup government. Someone [GA]*

spoke to our [community] leader, and the construction started. I realised [later] that the system has no connection to our treatment system." RE-07

EP highlighted that due to the constraints of the four-year term in the political structure, there is a tendency to adhere to existing approaches, i.e., structure measures, and allocate more funds to enhance capacity, which can provide quick results. They gave an example of the election campaigns in 2020 when aspiring governors promoted flood-related policies (EP-03/05/08). EP presented that construction projects can generate substantial profits for those institutions involved.

"The dam construction along the waterways in many provinces has repeatedly been rebuilt. This has led to the investment of corrupted money in the management loop, such as in Sukothai. The water overcomes the barrier inside the city …and breaks the embankment. They must rebuild it every 2-3 years by repeatedly requesting the budgets." EP-03

RE in Talad Nongchok disclosed that insufficient construction standards and budget limitations resulted in the abrupt failure of the Sanseab Canal embankment from 2019 to the present time (2020s). They mentioned that compensation was not provided to the affected locals (RE-08/09/10) (see more quotations in Appendix 3B).

5.3.4 Lack of autonomy

EP illustrated that the District Offices (DIO) typically find themselves in a one-way relationship where they receive orders from BMA without having the power to negotiate (EP-05). RE from Talad Nongchok revealed that even though the DIO is their closest authority, they lack significant decision-making powers where a dispute arose over a breached embankment along the Sanseab Canal (RE 08/09/10). RE described that DIO could not effectively address the situation or facilitate a resolution.

"We lodged complaints and sought assistance at the Nongchok DIO, highlighting our official residency in the district. I requested a meeting with the district leader and discussed the issue with him. The district leader clarified that the project was under BMA authority, and they couldn't address it at the district level." RE-08

RE from Minburi Upatum underscored this limited autonomy. The district leader was unable to exert full control over watergate operations during the significant flood in 2011. Despite their experiencing prolonged floods, the DIO could not assume responsibility or initiate contact or request that the watergates be opened (RE-05/06/07).

"The Sanseab Canal in this area falls under the RID, but the DSD oversees it. The DIO is assigned to take care but lacks the power to make decisions. During the 2011 flood, which lasted almost two months, the DIO couldn't help because they didn't have the authority to make decisions." RE-05

EP described this representative role of the DIO as shouldering the most challenging tasks when implementing projects in their designated area (EP-01/04). EP further described that in

the relocation or reordering of residents to accommodate new design projects, the DIO assumes a mediating role between residents and policy goals (EP-01) (see more quotations in Appendix 3B).

5.3.5 Meaning in resident engagement

Rhetorically…
GA revealed that redevelopment projects related to waterways originate from the expressed needs of residents and existing research projects. These initiatives are initiated in response to complaints voiced by locals. GA claimed that the projects start when residents report issues to the DIO, which then escalates the matter to the relevant agencies responsible for the specific area (GA-01/02/04/06).

> *"RobKrung Canal and Ban Kamin Canal projects are all under the Governor's policy. They originally stemmed from the requests of the residents. If the residents hadn't complained about the area or wanted improvements to the waterways, the projects would have never occurred." GA-06*

GA interviewees from DSD and PWD emphasised that the construction and elevation of river dikes aim to improve the safety of residential areas, addressing requests from residents (GA-01/04). A GA interviewee from DSD insisted they maintain effective communication with residents, especially when constructing embankments near private houses.

> *"We assess the needs of residents in flood-prone areas and have found that they all requested embankments to protect their properties. Despite suggesting relocation to flood-free zones, they insisted on staying in the same location but requested the construction of a dike to prevent flooding from the waterway." GA-01*

GA highlighted that the participation process is a central component of every project's implementation. They emphasised the necessity of conducting public hearings and engaged with communities to gather their opinions on the proposed plans (GA-02/05/06).

> *"We need to assess whether our policies might affect the residents. […] All projects under scrutiny must undergo a participation process at least once. Once we complete projects, we present them to gather feedback. […] The government's plans are initiated through the participation process in each community that will be impacted by the specific project …." GA-02*

Reality for residents…
RE from Talad Nongchok revealed contrasting perspectives, stating that the flood dike project was initiated without the residents' requests and without prior communication or notification to the community (RE-08/09/10).

> *"They [GA] never consider our viewpoints. The crucial issue is that they [GA] rely on the input of only a select few when making important decisions. In the case of this embankment project, they may consult with 10-20 staff members in a comfortable, air-conditioned setting, possibly including 10 ministers, 10 academics, or 10*

technicians. However, the longstanding presence and information of our community spanning centuries are completely overlooked." RE-09

RE described that the negotiations between them and the DSD after the embankment construction during 2017 to 2019 and the investigation process (Fig 5-23) by Office of the National Anti-Corruption Commission (NACC) and State Audit Office of the Kingdom of Thailand (SAO) for the failure of the dam (Fig 5-22) were essentially unhelpful (RE-09/10). RE described instances of government staff interfering, and extortion and threats arising during the construction phase (RE-08) (Appendix 3B).



Fig 5-22 The damaged embankment along Sanseab Canal in Talad Nongchok (Right) and lean of the structure (Left)



Fig 5-23 The GA's investigation to Nongchok Area where the embankment has been breached during 2020, Source: https://mgronline.com/qol/detail/9630000006638 accessed July 2022

RE in Minburi Upatum demonstrated that they tend to be excluded from decision-making processes due to being perceived as stakeholders who hinder the timely completion of GA's projects (RE-05/06/07).

"We often find ourselves having the most conflicting opinions on every issue they [GA] tackle, including the recent [Minburi Redevelopment] project. We are directly affected by the decisions they make, and as residents who live in this area every day of the year, we are the most crucial soles to consult. We possess a deeper understanding of our community than they do. Yet, unfortunately, they fail to recognise this fact." RE-07

The community leaders from all three communities revealed that their role as community representatives often involved one sole individual participating in the consultation or engagement process (RE-01/05/08). They insisted that government projects do not extend to

decisions involving the entire community and that communication is often intended to inform rather than engage (see more quotations in Appendix 3B).

5.3.6 Lack of research into implementation

EP presented that the consultation firm or academic agencies rely on the term of reference (TOR) procedure engaged to administer such research projects assumes the responsibility of conducting the study and furnishing academic perspectives upon completion. The course of implementation, however, follows a distinctly different structure, guided by the governor or leader's decision (EP-01/04/08).

> *"We are involved in the process, but we lack the power or influence to drive any actions or implement the projects we researched. We provide ideas and data, attend meetings with various organisations. However, the decision-maker remains silent, resulting in projects not being carried out." EP-04*

Interviewees described that if a research project period exceeds five years, additional time will be required to complete the research (GA-01/EP-01/08/09). EP presented that many BUW, such as Bankaro along Sanseab Canal, Chao Phraya Riverside, have been researched numerous times but have yet to be chosen for project implementation, and are still being chosen to repeat research studies (EP-01/08). EP presented that the Minburi Upatum community was excluded from the GA proposal, despite the fact that all research studies had covered this community and offered action plans (EP-01/03).

> *"TPD engaged my firm for the Minburi Project, encompassing four districts in the research plan. We conducted detailed town planning for urban development in this area. While Minburi Upatum was initially part of the research, it was later excluded due to unclear land ownership and prolonged communication processes with NOB. This may impact the implementation timeline if the community area is included." EP-01*

5.3.7 Data limitations in decision-making

Interviewees highlighted that data used to formulate projects and policies remain isolated within each agency's respective domains without adequate exchange (EP-02/04/IA-08).

> *"In the government system, there is insufficient gathering, sharing, and exchanging of information and data. Each agency has no idea what the other agency is up to. They start a progress game or bluff each other. They can never achieve efficiency since they are unaware of what occurs as a result of the data or information deposited." IA-08*

EP mentioned that government projects led by entities like the PWD, with, e.g. street construction or redevelopment projects, tend to be confined to specific boundaries without incorporating wider waterways or flow direction data into their formulation processes (EP-03/06/08). The DSD focuses on waterway metrics like water levels and flow rates, collected from measurement points across BUW. However, data pertaining to elevations of areas and boundaries along BUW are often neglected, and they do not exchange data with other agencies (EP-04).

EP illustrated that when discussing elevation changes within Bangkok's landscape, constructed streets or elevated land often lack proper elevation records, causing the absence of elevation data (EP-04/07/08). They noted that elevation surveys in Bangkok are notably lacking due to urban density and restrictions on accessing private property. GA discussed how financial considerations contribute to the challenge of obtaining elevation data, which poses a concern for investments.

> *"It's too risky for us [referring to BMA] to design the lowest area in Bangkok. The impact will be substantial, and property owners and investors won't agree if their lands are labelled as the lowest point. […] For instance, setting a lower level for areas like China Town Riverside could lead to a decrease in land prices, raising questions about responsibility for such issues." GA-04*

RE in Talad Nongchok disclosed that the government agency constructed the flood dike in their community without utilising local elevation data and never sharing the information with residents (RE-08/09) (Appendix 3B).

5.3.8 Different agencies' interests and limited knowledge

An interviewee, experienced in FAD's work, stressed their dedication to safeguarding underground archaeological sites, prioritising the prevention of construction that could compromise historical elements.

> *"Before any construction commences, FAD proposes investigating the area to determine if there is archaeological evidence that needs preservation. [..] Historical evidence had to be investigated before the subway construction could begin. […] FAD advised DSD to postpone the water pipe replacement until the subway is constructed in the same location." IA-08*

A GA interviewee from DSD expressed a focus on improving drainage capacity in conservation areas by enhancing the underground piping structure.

> *"The drainage system in the Old Town area has 30 cm gutters, which are insufficient to discharge floods during heavy rains. We [DSD] sought to modify the pipes to 80-100 cm. […] We cannot afford to squander time or money on construction in the dirt. The construction also cannot wait for the archaeology work to be completed as FAD recommend us […] We then moved on to improve other structural measures such as raising the height of dikes, which can be done more easily" GA-04*

EP described that DSD always opted to implement similar structural measures as their interest is solely on the drainage function of waterways (EP-01/06/08). They revealed that the planning of the Minburi Project encompassing waterway boundaries cannot progress without the DSD's involvement, which is focused only on the drainage channel with structure.

> *"If we want to suggest a walkway along the canals which affects the existing embankment, we must talk with DSD. And this is very difficult to happen if we want to change the existing structure of [the embankment]. […] TPD can propose*

developed projects along the waterway's location. When it comes to implementation, the construction permit has to be passed by DSD because the area includes the boundary of canals. […] They strictly prevent us from building anything within the boundary of canals". EP-01

5.3.9 Time and fiscal limitation

EP interviewee working on the Minburi Project revealed that public engagement can be time-consuming and generally uncertain.

> *"The TPD's focus on implementing the Minburi Project within 1-2 years led to the exclusion of [Minburi Upatum] community areas. This was due to the extended communication process required with both residents and landowners." EP-01*

GA highlighted the problem of exceeding stipulated timeframes, which many agencies strive to avoid by expediting projects to meet their deadlines (GA-01/02/04/07).

> *"The urgency of completing the project within the specified time frame is crucial. If the project exceeds the designated timeframe, the SAO will initiate an investigation, which authorities aim to avoid. Collaboration is a time-consuming aspect. […] Prolonged project timelines pose a significant challenge for all authorities." GA-07*

Interviewees underscored that the implementation of expensive flood control structures, which are required to achieve engineering capacity goals, faces budgetary limitations (EP-04/GA-04). A GA interviewee from DSD mentioned their struggles to secure adequate funds for construction, resulting in their projects often falling short of design capacity.

> *"We [DSD] initially plan for water pipes with a 1-meter diameter based on our data, but due to budget constraints, we have to reduce it to a 0.80-meter diameter. Constructing even a single road, canal embankments, or water tunnel requires a significant budget, and we don't have the funds to build to maximum capacity." GA-04*

In Minburi Upatum, a community leader highlighted an incident where the community requested the renovation of a bridge over the Sanseab Canal from the DIO. Due to the absence of an allocated budget, the community leader had to make repeated request since 2018. Ultimately, the bridge's renovation was only considered as the Skytrain rapid transit project neared its final stages in 2021 (RE-05) (Appendix 3B).

5.3.10 Insufficient regulation and enforcement

EP emphasised the common practice of disposing of trash into waterways, a practice allowed by law (EP-04/05). Also, RE in Talad Nongchok highlighted that housing projects lack legal controls to ensure adherence to standard treatment system requirements before releasing waste into waterways (RE-08/09).

> *"There are housing estates located near our communities. They didn't build the treatment system but instead joined their wastewater pipes to ours, then fed directly into the [Sanseab] canal. […] The authority advised them to build their wastewater treatment, but they didn't. The government office didn't oversee the process during the housing construction, and they finished without constructing the wastewater treatment." RE-08*

A GA interviewee from RC-ONEP addressed that their policy serves as a guideline rather than a direct control measure. Only government authorities are required to undergo a consideration process. They addressed that they cannot reject projects outright but academically provide alternative suggestions (GA-05). Interviewees described that the Rattanakosin Plans from RC-ONEP are minimally relevant to implementation (EP-03/09/10/IA-08).

> *"The current Rattanakosin plan (2019) differs significantly from the old ones, resembling more of a research study than a clear policy plan. The vision and goals are not as clearly defined." IA-08*

Interviewees also noted that the TPD and RC-ONEP's guidelines designating areas along waterways for recreation or public use are not widely embraced or enforced. They highlighted that these organisational proposals have little influence on the implementation of projects along waterways (GA-04/EP-01) (Appendix 3B).

5.4 Desirable changes for Bangkok Urban Waterways

5.4.1 Enhanced ongoing management

Calling on the interview results, this section describes Scenario I (Fig 5-25), which is a combination of five management schemes (1)/(2)/(3)/(4)/(5) (Appendix 3D) recommended predominantly by interviewees from GA and EP (depicted in Fig 5-24). This scenario emphasises improving the current management direction.

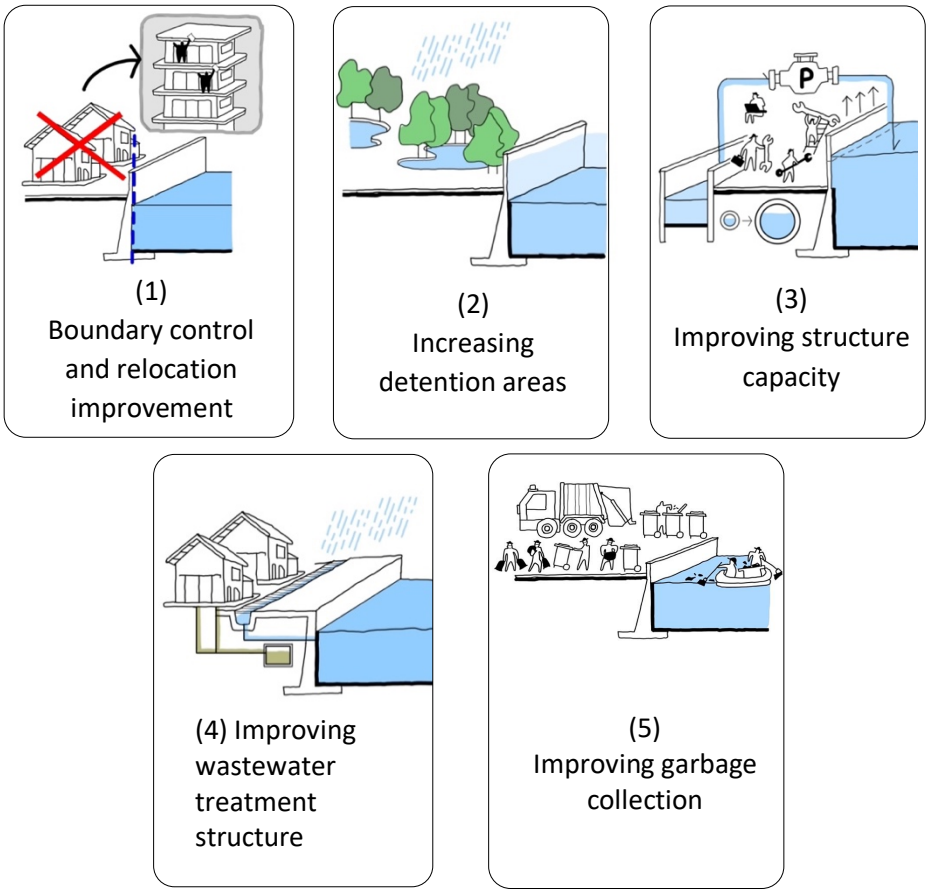


Fig 5-24: Five schemes representing Scenario I: Enhanced ongoing management

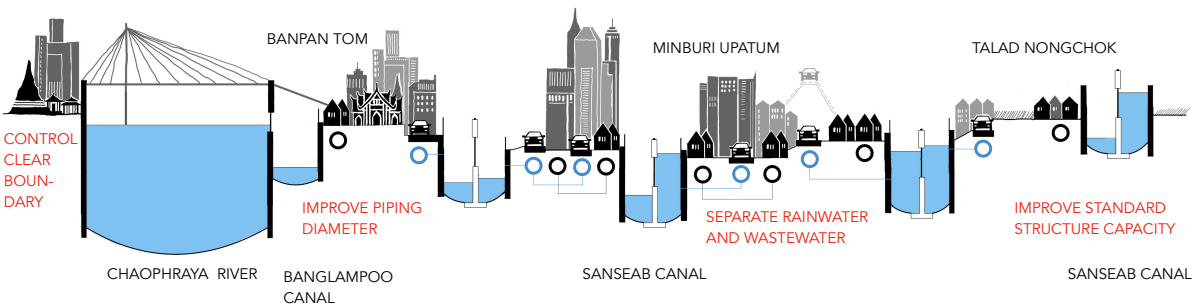


Fig 5-25: The eastern BUW's section diagram representing scenario of "enhanced ongoing management"

(1) <u>Boundary control and relocation improvements</u>

Predominantly, GA interviewees recommended maintaining well-defined boundaries for waterways (Fig 5-25), including their banks, which should function primarily as free-flow drainage channels. They stated that this will help counter erosion and enhance the waterways' control capabilities, making tasks like dredging more feasible (GA-01/03/04).

> *"The embankment serves to enhance and regulate both the width and depth of the canal, making it especially useful during dredging. Without the embankment, the canal's banks would naturally slope at a 1:2 ratio, which would be counterproductive and space-inefficient. Therefore, we construct embankments to create additional space for water containment within the canal. This not only increases the canal's capacity but also allows for greater depth." GA-04*

The important of having a spatial relocation policy was presented by EP as a crucial tool for enhancing waterway boundary management (EP-05/07). They described that adequate compensation and the establishment of a supportive social structure are essential for residents who are required to relocate, as seen in Talad Nongchok (see Table 5-1).

> *"They [GA] need to look back to the process and how the policies impact to the residents. When relocating residents, how can we avoid making them more vulnerable? There are still problems from floodplains and the lack of an appropriate social structure, for instance. New locations should offer viable occupational opportunities for those being relocated." EP-05*

(2) <u>Increasing detention areas</u>

A GA interviewee from DSD described how increasing the detention areas should be considered to address the limitations of the existing pumping infrastructure, which struggles to handle substantial rainfall (GA-04). Interviewees outlined their preferred locations for detention areas, emphasising their placement within the new densely populated urban zones, such as the Minburi Area (GA-04/EP-04) (see Table 5-1).

> *"We propose to find the detention area to retain the amount of water located between the drainage systems. […] Our calculations indicate that the peak water flow rate is 100 mm/s, resulting in an estimated volume of 70,000 cubic meters of water. To manage this, the plumbing system can efficiently drain 50,000 cubic meters of water from the area. However, we need to identify a suitable detention area capable of retaining the remaining 20,000 cubic meters of water. This measure is essential to prevent excess water from flooding the urban area." GA-04*

EP described how waterways play a pivotal role in facilitating the diversion of water from detention areas, contributing to comprehensive flood management. The selection of detention areas must be considered in terms of their compatibility with existing drainage structures (EP-04/06).

"…The water that will be drained in the concrete area will rise by 2 times or more than 50%. This means there is a significantly increased workload in the built-up area despite the same amount of rainwater. Detention areas are needed to help mitigate this load, and their compatibility with existing drainage structures, including waterways that can direct water to the river, should be considered." EP-04

A GA interviewee from TPD recommended this approach in principle, as they have introduced a policy proposal concerning detention areas, advocating its inclusion in the comprehensive plan. However, this has not happened. TPD's proposal aims to ensure that development projects allocate space for detention areas within individual properties (GA-02) (see Appendix 3C).

(3) <u>Improving structure capacity</u>

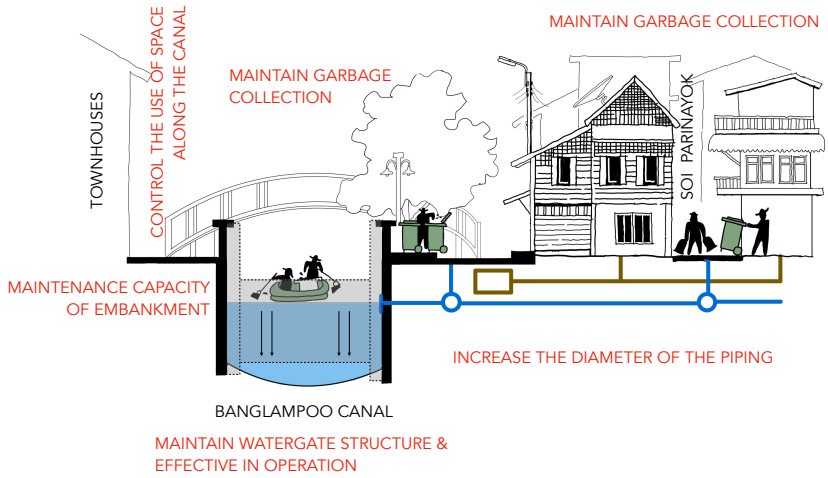


Fig 5-26: Enhanced ongoing management as recommended in Banpantom (Table 5-1)

EP emphasised the importance of efficient watergate operations and the maintenance of these structural measures (EP-04). A GA interviewee from DSD suggested augmenting pump capacities and upgrading pipe diameters across Bangkok, including the conservation zone and Banpantom (Fig 5-26) (Table 5-1). They reviewed that the current design capacity cannot hold the actual rainfall.

"When we decide on structural capacity, the amount of rainfall we use is 60 mm/s [in Bangkok]. Our design is not sufficient to support the drainage system. We are now considering this number to 80 or 100 mm/s as the highest amount of rainfall that should fall in the urban area. The existing pipe diameter is 40 cm. These should be changed to 60 cm, and this change should be implemented all over Bangkok." GA-04

A GA interviewee from RID recommended transitioning towards automated computer-based operations for watergate management. He recommended using technology as a future approach to enhance management practices and achieves the envisioned positive changes.

"Our emphasis has been on the concept of intelligent, smart, or innovative governance. […] However, it's crucial to note that such systems require qualified technicians for proper maintenance. Any errors or malfunctions in these tools

[watergates, pumps, etc.] could have severe consequences. Therefore, while manual systems are still in use, we anticipate the need for advanced automated systems in the future." GA-03

(4) Improving wastewater treatment

The large-scale separation of wastewater and rainwater was underscored as a crucial concern by interviewees, who noted that any future approach must address this issue due to its direct influence on the quality of BUW (EP-01/03/04/05-10, GA-01/03/04/06/08, IA-08/09). Interviewees emphasised the importance of raising awareness and initiating government-led efforts or enforcement, including educating households about effective wastewater management and advocating for action that spans from individual households to the broader city scale (EP-04/IA-09).

> *"I recommend that the very first thing to do is to establish wastewater treatment points along the canal before the wastewater from the pipes flow through the waterways. Taxation or treatment costs may need to be applied, especially for investors, real estate, and department stores." EP-10*

Interviewees proposed that the wastewater piping typical in Banglampoo Canal, which prevents wastewater from being directly discharged into the waterways, should be offered across all of Bangkok's waterways (GA-02/04/06) rather than only in selected canals (EP-03/09/10). EP recommended enhancing the piping infrastructure of older houses to enable them to connect to the main wastewater management system (EP-03/04).

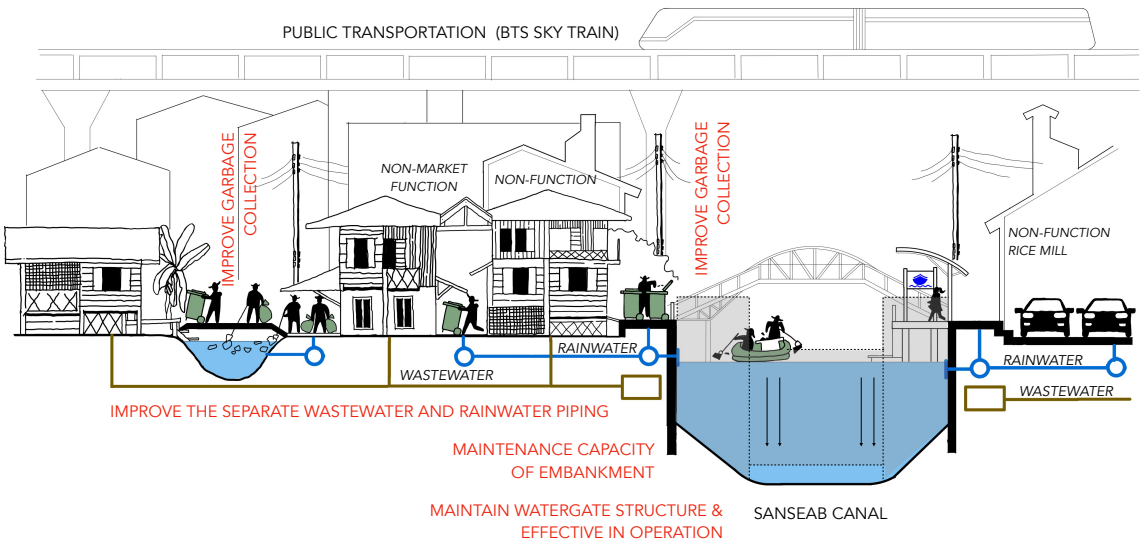


Fig 5-27: Enhanced ongoing management as recommended in Minburi Upatum (Table 5-1)

(5) Improving garbage collection

EP underscored the significance of proper garbage collection along the BUW area as a means of enhancing the future water quality of the BUW. They explained that the issue of inadequate trash disposal in the BUW, particularly in urban areas, influence directly on water quality (EP-04/05/06) (more quotations in Appendix 3E).

> *"They [GA] should assess whether residents have access to government public facilities, including trash collection services. It's possible that narrow alleys or dead-end streets could prevent trash collection vehicles from reaching the community, or there might not be enough trash cans provided for the number of residents. GA could address these issues by deploying smaller vehicles or manpower to collect garbage in narrow routes." EP-05*

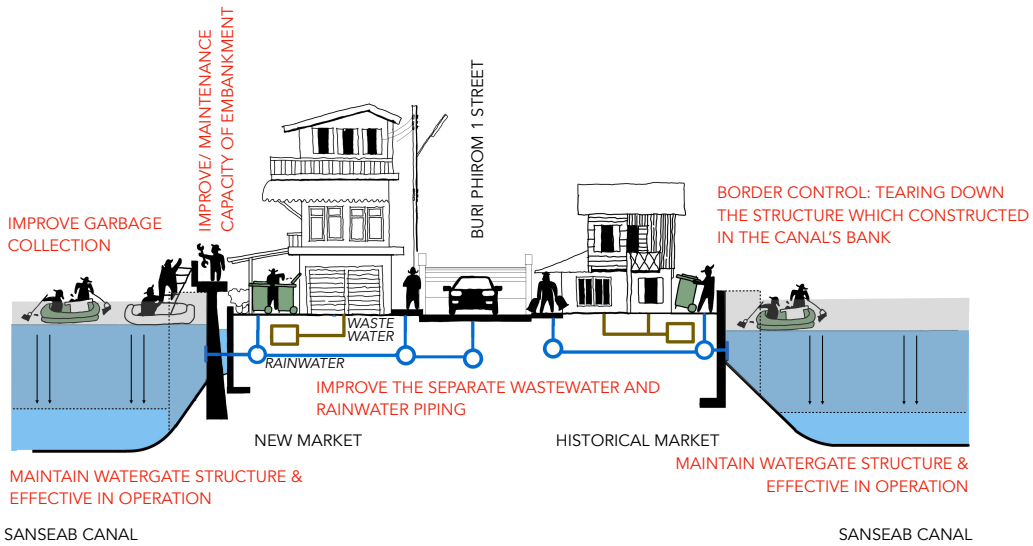


Fig 5-28: Enhanced ongoing management as recommended in Talad Nongchok (Table 5-1)

The importance of awareness was highlighted by EP, with an emphasis on encouraging small-scale efforts, including among children, to maintain the cleanliness of the waterways (EP-04/07). EP introduced the concepts of long-term waste management as crucial factors in managing garbage, considering the overall system of waste.

> *"DSD is responsible for removing garbage from the historical canals in Bangkok. However, after collecting trash from [e.g.] the Ong Ang canal, it's unclear where they dispose of it. It's essential for them to assess the entire management system, considering both the source of the garbage and its disposal location. This approach is known as Life Cycle Assessment or LCA, which provides a comprehensive view to determine the appropriate disposal sites." EP-07*

Scheme	Banpantom	Minburi Upatum	Talad Nongchok
(1) Boundary control and relocation improvements	Regulate functions at the roadway/dam along Banglampoo Canal, while ensuring RE receives suitable benefits and mitigate adverse effects.	-	The proper compensation must be determined for those locals residing along the banks of Sanseab Canal who are required to relocate.
(2) Increasing detention areas	-	The incorporation of detention areas must be considered in preference to the current redevelopment plans, rather than rigid water feature design.	
(3) Improving structure capacity	The pipe diameters in the conservation zone should be upgraded from 40 cm to 60 cm.	The increase in pipe diameters and the installation of pumps to facilitate efficient water diversion must be considered.	The stability of the dike along Sanseab Canal must be improved, and the standards of the structure must be regulated effectively. Regular maintenance is required.
(4) Improving wastewater treatment	-	The ongoing (2019) wastewater treatment project must integrate the pipes into the community's residential architecture, especially the antique one.	GA must effectively regulate wastewater treatment from the housing estate. This area requires a wastewater treatment structure, and the system should accommodate the antique architecture.
(5) Improving garbage collection	-	The garbage blockages in minor waterways must be resolved. GA should encourage household awareness of garbage disposal in waterways.	Effective garbage collection and disposal in the area near Khlong Simsam (Buri Phirom 1) are required.
(6) Restoring waterflow and network	The river should flow through watergates (from Banglampoo to OngAng Canals). Tidal conditions might be reintroduced to restore the water flow. Minor waterways, along a temple or within community, might be considered for reconnection.	The obstructed water flow from the northern Sanseab Canal should be restored. A minor waterway in the community must be restored to flow into Sanseab Canal.	Sanseab Canal should be restored to allow flow into other canals. The water flow from Sanseab Canal to Simsam Canal might be considered for reconnection.
(7) Restoring waterway banks	The waterway's original width could be considered for restoration.	The minor waterway bank should be restored. Sanseab Canal's bank in this area could be considered for restoration through vegetation.	Sanseab Canal's bank in this area must be restored to revive the natural habitat of the areas.
(8) Granting permission to inhabit and earn a livelihood	The livelihood of locals must be supported. Facilitating occupations like vending or merchant activities, or waterfront vending must be considered.	The redevelopment plan needs to prioritise the granting of clear ownership rights to the locals. A secure living environment for the locals and long-term inheritance issues must be addressed.	The embankment project should consider obtaining permission from locals along the canal's bank. The sustaining of locals' economic well-being in the existing market must be considered to avoid disruption.

Scheme	Banpantom	Minburi Upatum	Talad Nongchok
(9) Enabling access for routine consumption	Piers must be provided for Loy Kratong Festival.	Piers must be provided for fishing activities and local boats accessibility.	Adjusting the structure's height and introducing features like stairs and piers to enable access to the water must be considered.
(10) Equilibrating the operation of watergates	Banglampoo watergate must be opened more frequency to maintain flow and prevent pollution.	Minburi Watergate must be opened to prevent significant flood/ prolonged flooding.	Nongchok watergate must be opened more frequency to maintain flow and prevent water pollution.
(11) Providing safety and security	Lighting must be improved to ensure safe functionality along the walkway by Banglampoo Canal.	Lighting must be improved to ensure safe functionality along the walkway by Sanseab Canal. Installing CCTV systems should be considered to address safety in this TOD-influenced area.	-
(12) Floodable land use at the waterway edge	Floodable area at the Banglampoo Canal's bank (together with reintroducing the historical canal's width) could be considered, and the roadway/dam would retain its full functionality as an elevated structure provided.	Space along Sanseab Canal in this area should be provided with (e.g.) elevated structures. Duplicated functions would occur during the dry season, when this space would accommodate the overflow of water during flood seasons.	Area at the edge of Sanseab Canal should be modified to accommodate a greater volume of water during flood seasons. Duplicated functions could be considered.
(13) Considering heritage or area identity	The relationship of locals with Banglampoo Canal must be restored, and the appearance of the waterbody should be enhanced. Restoration of the canal might be considered, while taking caution regarding erosion risks and potential impacts on archaeological sites.	A sense of closeness between the waterways and the people who utilise the area must be restored. The redevelopment plan must be harmonised with this historical floodable landscape, with Sanseab Canal as critical context.	The existing symbolic historical wisdom in adapting to natural water levels, i.e., existing traditional architectural houses, should be valued.
(14) Emphasis on public water transportation	The route of boat transportation in Banglampoo Canal must be considered for implementation.	The stability of boat route operations in Sanseab Canal in this area must be encouraged.	-
(15) Providing recreational public access	Implementing a green space design along the roadway/dam by Banglampoo Canal should be considered to create a more inviting environment.	The efficient walkway connections along Sanseab Canal, bridging gaps where embankments are currently absent, should be considered.	Sanseab Canal's embankment should be renovated to establish a recreational area, enhancing the overall aesthetic, and the existing height of the structure must be modified.
(16) Involving investors and developers	-	The parking lots and rice mills along Sanseab Canal could be redeveloped by investors to serve publicity.	-

Table 5-1 The desirable management of three-community's scale recommended by stakeholders.

5.4.2 Natural restoration

This section describes Scenario II (Fig 5-30), which is a compilation of two management schemes (6)/(7) (Appendix 3D) suggested by interviewees, especially from experts (depicted in Fig 5-29). It highlights the significance of considering the natural condition of waterways and understanding the natural landscape of BUW as part of the network system.

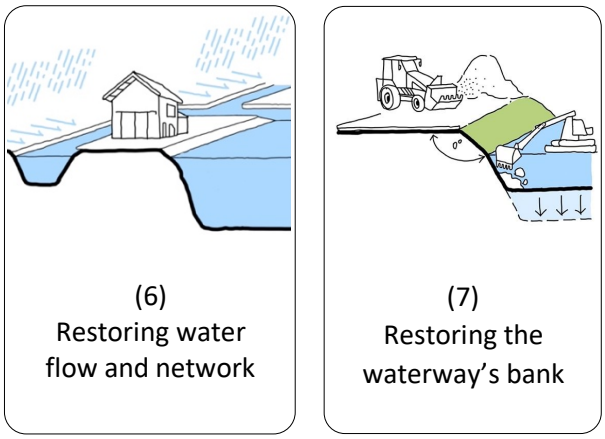


Fig 5-29: Two schemes representing Scenario II: Natural restoration

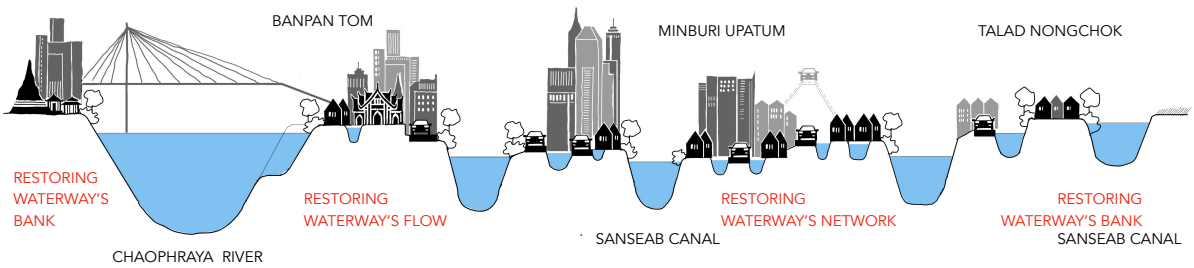


Fig 5-30: The eastern BUW's section diagram representing scenario of "natural restoration"

(6) <u>Restoring waterflow and network</u>

EP recommended restoring interconnected waterways through open channels and surface drains (EP-02/04/06/07/08). They described how aligning and restoring minor waterways is crucial for unified water flow, considering Bangkok's flat topography. They also highlighted the need to understand water flow speed and address blockages within urban areas.

> *"Creating a network of interconnected small canals is crucial. Such a waterway network can effectively mitigate flood impacts by providing widespread coverage. These waterways should be considered "critical infrastructure" as they play a vital role in helping the city cope with uncertain changes, such as flooding. It's essential to recognise that numerous small waterways feed into the main waterways, and ensuring the survival of this network relies on safeguarding these minor components. […] Allocating space for connecting waterways on each property should be considered." EP-02*

In cases where specific spaces that once served as interconnecting waterways are now densely developed, EP recommended replacing them with underground structures or pipes during the restoration process, as may be applied to Banpantom (Table 5-1). They stated that it is crucial for the flow of water to align with the established network of waterways rather than relying on forced redirection or pump bypasses (EP-02/03/04).

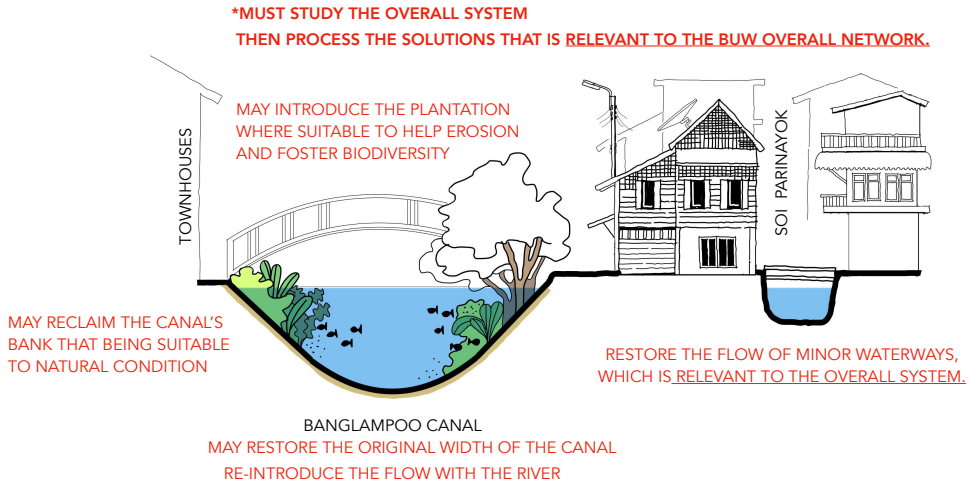


Fig 5-31: Natural restoration as recommended in Banglampoo (Table 5-1)

"The revisualisation of the waterways system might not only involve above-ground changes but also include underground structure if the area is already occupied by critical functions, such as streets. […] The concept here is to restore the flow of waterways to their natural state." EP-02

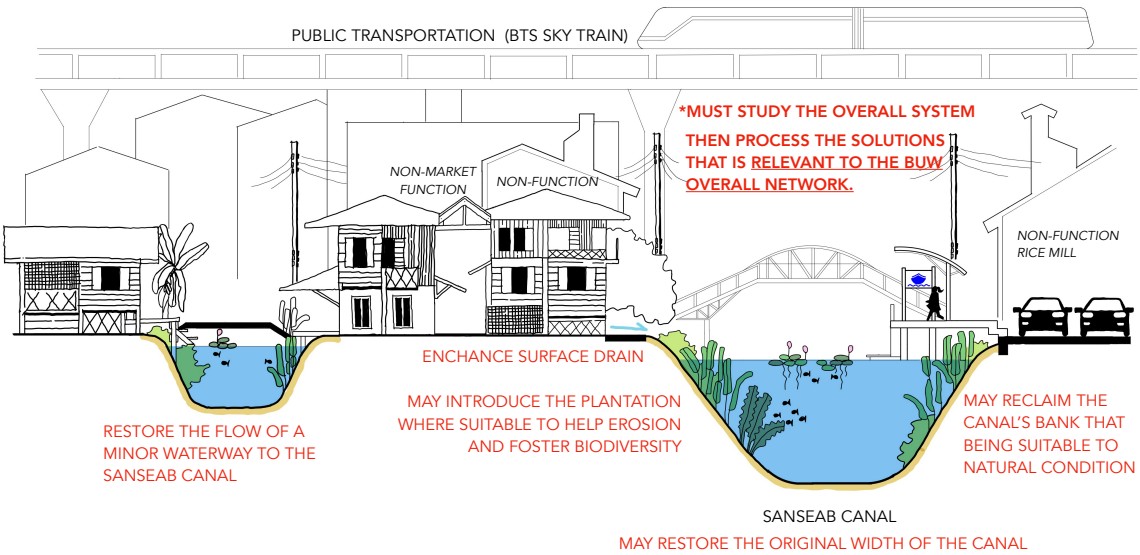


Fig 5-32: Natural restoration as recommended in Minburi Upatum (Table 5-1)

"The initial step in developing the Minburi neighbourhood should take be the reconstruction of the lagoon and the excavation of open ditches for water retention and drainage purposes. […] I propose that we focus on clearing and maintaining the natural water channels while also placing significant emphasis on restoring the waterways." EP-03 (Fig 5-32 and Table 5-1)

(7) Restoring waterway banks

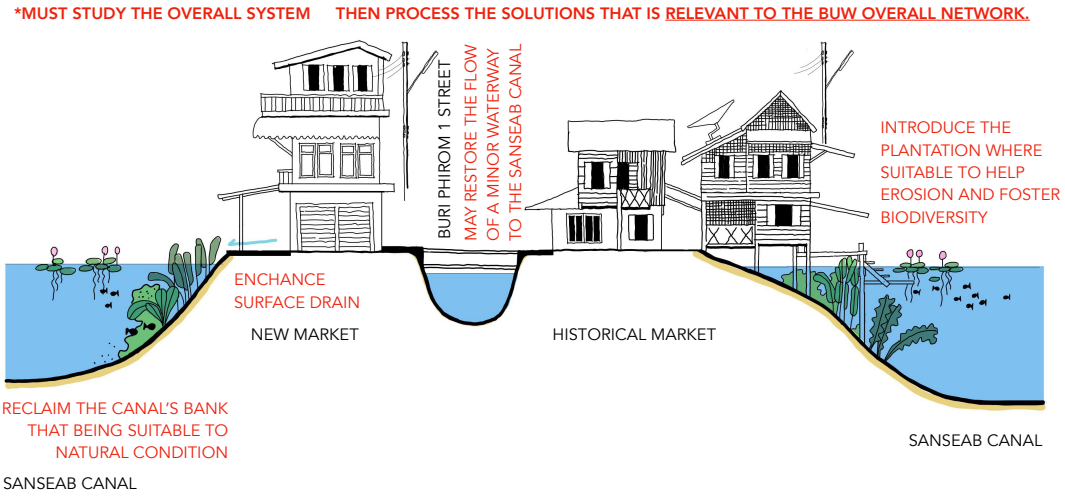


Fig 5-33: Natural restoration as recommended in Talad Nongchok (Table 5-1)

EP recommended enhancing biodiversity by emphasising the importance of plants in the habitat cycle, especially on waterway banks (EP-02/03/08), which could apply to Talad Nongchok (Fig 5-33) and other areas (Table 5-1). In the urban BUW context, EP stressed prioritising water quality improvement and recommended a closed system design, creating a loop for better water quality control, and incorporating sediment build-up.

> *"This can be seen as a closed system in operation, demonstrating biodiversity within the BUW. We can construct an area where plants could survive and simultaneously restore the waterway's bank. When small aquatic animals thrive in this environment, larger animals are likely to follow suit". EP-06*

> *"I recommend transforming constructions along waterways into natural banks with stable slopes and using vegetation as a defence against erosion. This restoration will naturally lead to sediment accumulation at waterway banks. […] We really need to restore the waterways to connect with the river to introduce the natural flow; the water would bring the sediment to add up at the bank naturally." EP-03*

EP highlighted the importance of human involvement in maintaining the BUW during the restoration process. Dredging-related tasks, which must be appropriately aligned with natural cycles, are emphasised as essential and ongoing requirements, given that these waterways have been human-engineered since ancient times. The issue of shallowness should also be acknowledged as a recurrent challenge that management needs to address and sustain (EP-03/06) (Appendix 3C)

5.4.3 Prioritising benefits for locals

This section describes Scenario III (Fig 5-35), which is a compilation of four management schemes (8)/(9)/(10)/(11) (Appendix 3D) recommended predominantly by RE, EP and IA (depicted in Fig 5-34). This scenario highlights a focus on addressing the requests and preferences of the local community.

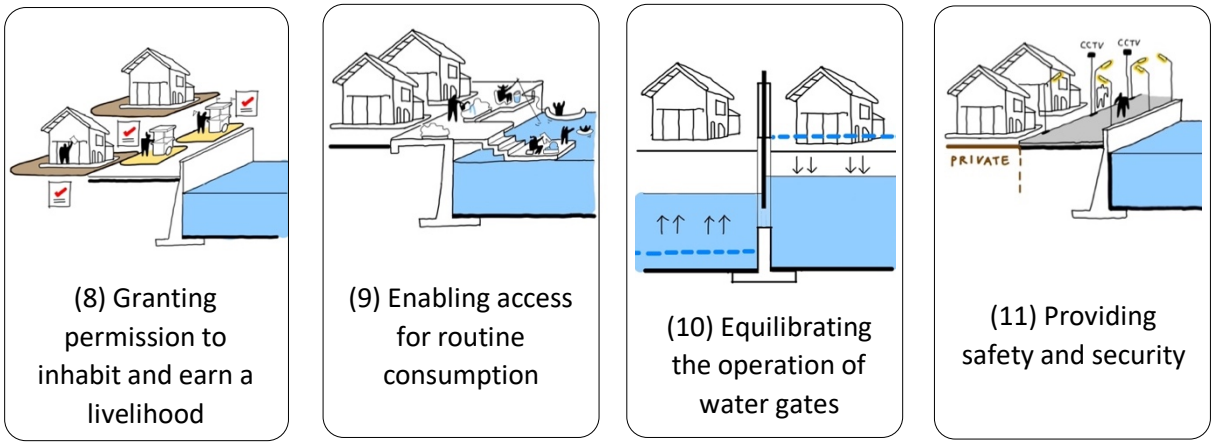


Fig 5-34: Four schemes representing Scenario III: Prioritising benefit for locals

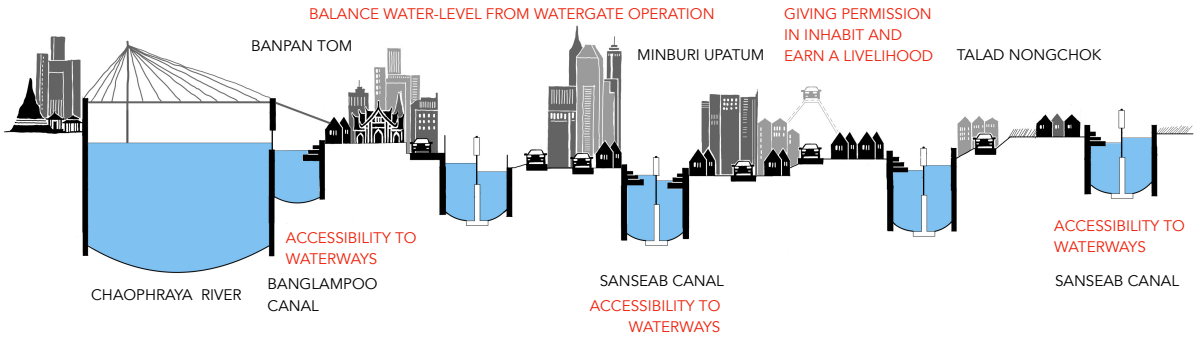


Fig 5-35: The eastern BUW's section diagram representing scenario of "prioritising benefits for locals"

(8) <u>Granting permission to inhabit and earn a livelihood</u>

Interviewees were concerned about legitimising local settlements along the waterways, considering granting these spaces to the local residents to inhabit and earn a livelihood. They emphasised the importance of providing legal rights to the locals and recognising the significance of social activities (EP-03/05/IA-08/09).

> *"Wherever the slum settled, they will be bad both inland and along the canals. If the problem was the dense settlement, they [GA] should manage more area and improve facilities for them. […] They [GA] should allow residents to live and then help them to live properly. This will be appropriate wherever they live: along waterways or inland." EP-03*

Meanwhile, RE recommended that projects should not interfere with the sustained livelihood of local residents. Instead of relocating them or developing areas to serve tourists, they appeal for the space to be used for their functions (RE-01/02/03/05/07/09/10) (Table 5-1).

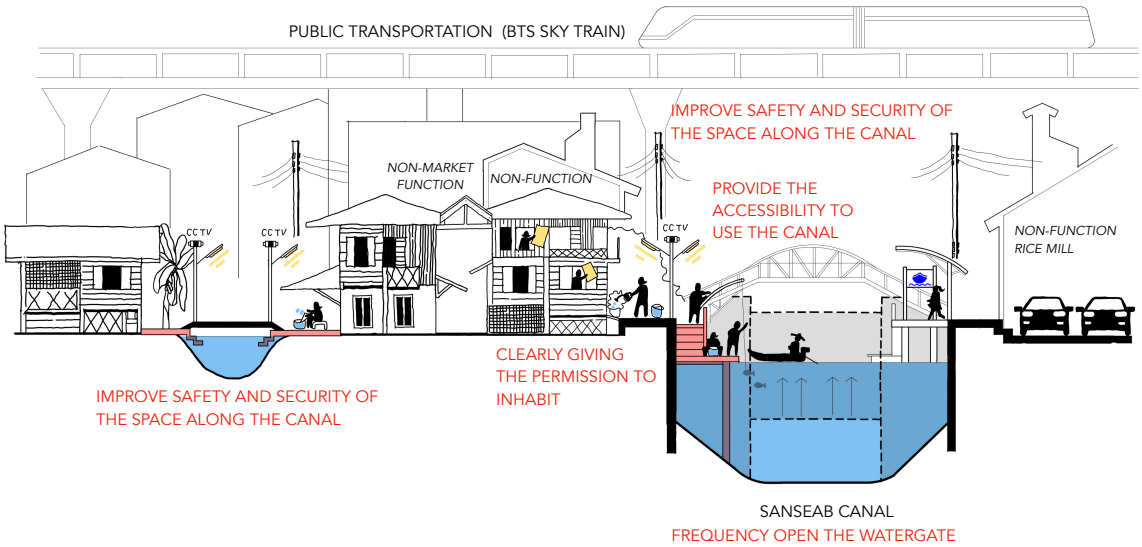


Fig 5-36: Prioritising benefits for locals as recommended in Minburi Upatum (Table 5-1)

> *"I would like to have a secure location for us and our young generation to live here [Minburi Upatum]. I think it might be good if the government came here helping residents to gain secure income from their development plan." RE-05*

> *"We find contentment in our homes, even though there may not be many visitors purchasing goods, as our market mainly caters to locals rather than tourists. This is acceptable to us. We do not have to pay rent; these are our homes, and we genuinely love living here and wish to continue doing so." RE-09*

(9) <u>Enabling access for routine consumption</u>

EP recommended ensuring that future BUW developments grant accessibility to the waterbody, accommodating various utilisation purposes (EP-03/05). IA recommended envisioning the BUW as a shared access point, facilitating daily utilisation (IA-09). RE from three communities requested the renovation of embankments and the provision of piers for accessing the waterbody (RE-05/06/07/08/09/10) (Table 5-1).

> *"Despite the presence of the embankment, some of us continue to use local boats because many houses along the canal have private piers. We believe that creating more access points to the canal could benefit us, such as providing fishing terraces, piers for children to swim, and spots for Loykratong celebrations." RE-05*

> *"I requested the authorities to dismantle the [embankment] structure. If it's possible to remove all of it, please go ahead. But if not, lowering it by half would also be a significant improvement for us. […] It would be greatly appreciated if they could provide us with a pier." RE-08* (Fig 5-37)

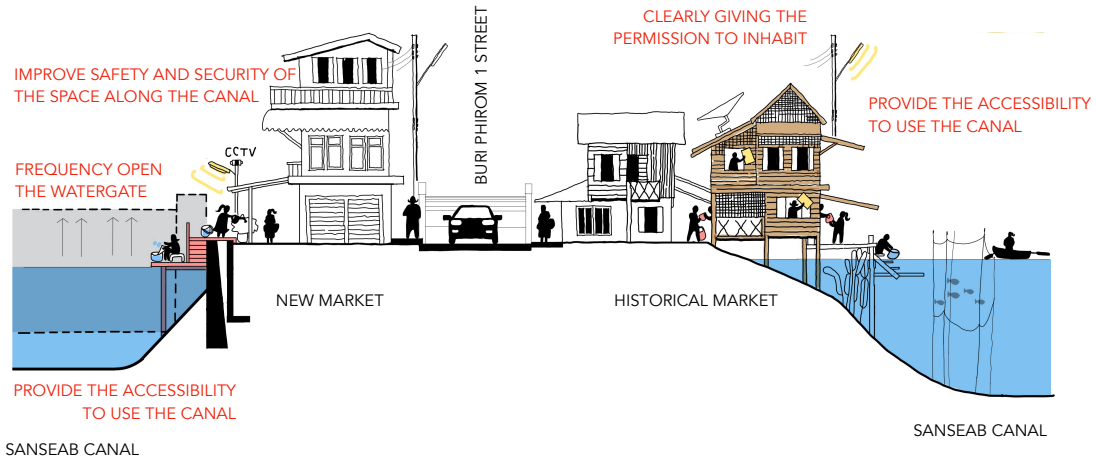


Fig 5-37: Prioritising benefits for locals as recommended in Talad Nongchok (Table 5-1)

(10) <u>Equilibrating the operation of watergates</u>

RE recommended opening the gates more frequently across the three study sites (RE-02/03/05/06/09/10) (Table 5-1).

> *"During the flooding in Minburi, if they had opened the gates to allow water to flow into the Bangkapi area, both Minburi and Bangkapi might have had nearly the same water level, and we may not have experienced severe flooding. […] I think the authorities chose to barely open the watergates, allowing water to flow slowly and preventing a rush of water, which might have prevented flooding to some extent." RE-07*

EP suggested providing more accessible data to residents and incorporating the community's input into decision-making processes, particularly regarding the larger-scales operation of watergates (EP-04/05/07) (Appendix 3C).

(11) <u>Providing safety and security</u>

RE described that since the BUW is expected to attract a diverse range of users due to its urban accessibility, addressing safety concerns is vital. This includes measures to prevent accidents, ensuring well-lit and well-maintained spaces, and managing potential hazards (RE-01/02/05/07 (Table 5-1).

> *"…More lights during the night, I would say that. The light usually doesn't work during the night, and the area becomes too dark to use." RE-01*

> *"Unfortunately, the lighting often doesn't function properly. It's essential to improve the lighting infrastructure in this area to ensure safety, particularly along the walkways that run parallel to the Sanseab Canal. […] There are also safety incidents that I would ask them to help improve. Because our properties become adjacent to the public walkway." RE-07*

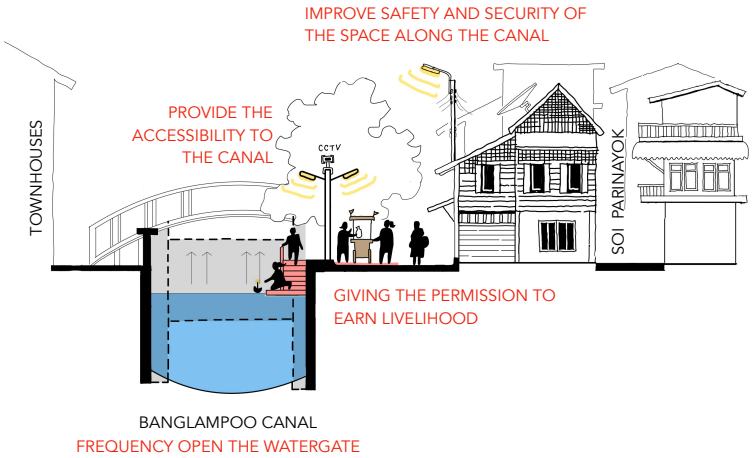


Fig 5-38: Prioritising benefits for locals as recommended in Banpantom (Table 5-1)

Interviewees considered both the physical safety aspects and the privacy of the communities that interact with and live along the BUW. They indicated the broader goal of creating a welcoming and secure urban space for residents and visitors alike (EP-05/IA-09) (Appendix 2C).

5.4.4 Floodable land use with heritage consideration

This section describes Scenario IV (Fig 5-40), which is a compilation of two management schemes (12)/(13) (Appendix 3D) recommended especially by EP and RE (depicted in Fig 5-39). This scenario highlights a focus on the heritage dimension with flexible or adaptable land use.

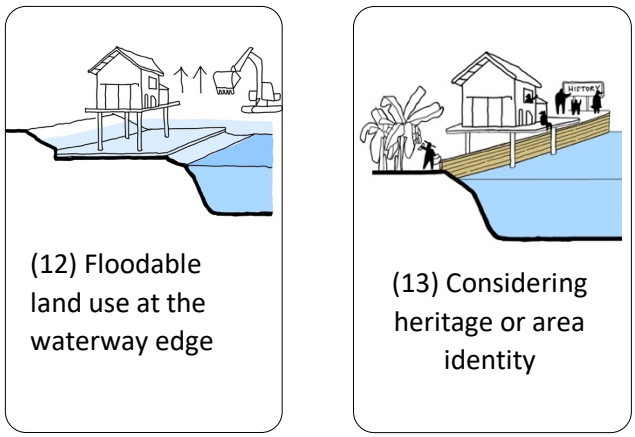


Fig 5-39: Two schemes representing Scenario IV: Floodable land use with heritage consideration

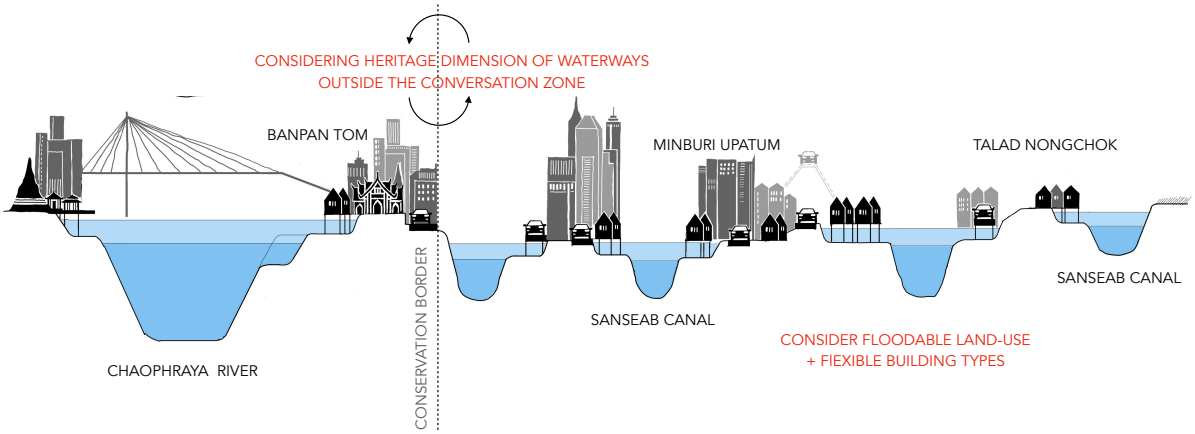


Fig 5-40: The eastern BUW's section diagram representing a scenario of "floodable land use with heritage consideration"

(12) Floodable land use at the waterway edge

EP envisioned a flexible future for BUW where specific areas, such as waterway bank, could accommodate water overflow and serve various purposes during dry periods (EP-03/08/09). Interviewees addressed the potential to align with Thailand's monsoon seasons and highlighted the importance of a flexible land use approach based on historical lifestyles (EP-09/10/IA-08). Practical aspects include designing architecture with elevated structures to naturally accommodate floodwaters, as demonstrated in Talad Nongchok with its less dense condition, and the Minburi Area, which holds potential for flexible urban functions. Additionally, government authorities must support this with facilities and incentive policies (EP-03/09) (Table 5-1).

> *"This might relate to building control regulation. The first-floor area in the dry season of 6-8 months will normally be used. The urban farm or orchard could be created, and the street could be constructed basically, but it just cannot be used within 4 months. Then, residents used water transport instead and parked their cars inside the elevated parking lot. The street tunnel might be constructed according to emergency use during flood seasons." EP-03*

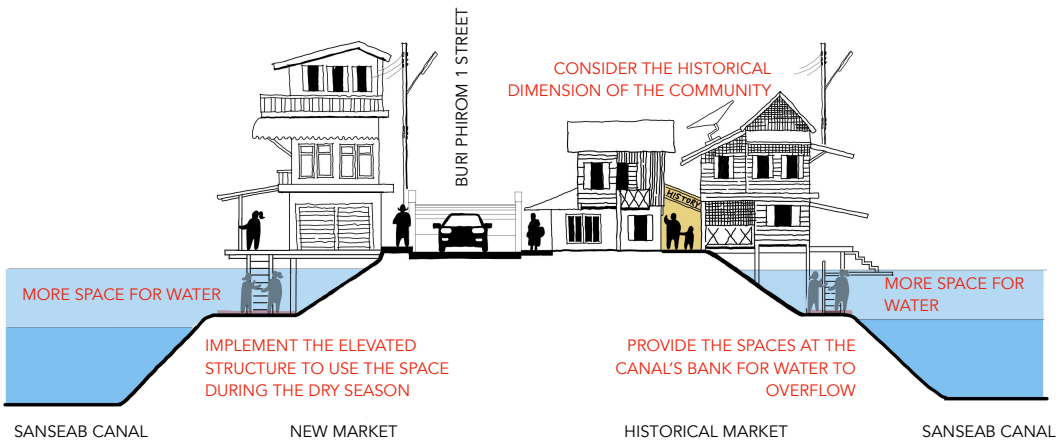


Fig 5-41: Floodable land use with heritage consideration as recommended in Talad Nongchok (Table 5-1)

EP recommended incorporating waterways into comprehensive plans, designating them as "risk areas" to allow for flexible functions throughout the seasons (EP-03/08/10).

> *"I recommend that the Minburi team revises the land use plan to incorporate multiple layers, not just floodways. […] During the dry season, urban amenities such as pathways along the Sanseab Canal might be repurposed temporarily. During the flood season, the area could accommodate increased water retention." EP-09*

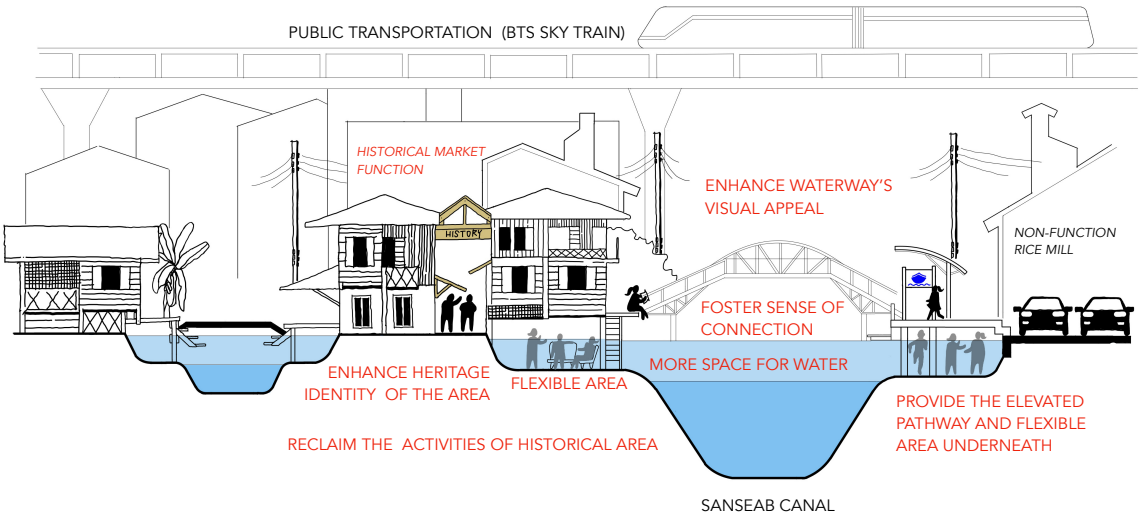


Fig 5-42: Floodable land use with heritage consideration being recommended in Minburi Upatum (Table 5-1)

(13) <u>Considering heritage or area identity</u>

Interviewees presented that the preservation of settlements along waterways in historical communities should be considered, contingent upon adherence to acknowledge the historical information (EP-03/IA-08/RE-01).

> *"There are many ways to implement creative ideas for preserving both valuable houses and public space. Instead of tearing them down, I suggest keeping some valuable houses with informational boards or signs. This will be very useful for the new generation. [Otherwise] They might never acknowledge this history." RE-01*

EP addressed the importance of employing techniques and consultations in water engineering, customised to each area's identity, when recommending the preservation of certain floodplain landscapes, as mentioned for the Banglampoo Canal (EP-03/09/10) (Fig 5-43) (Table 5-1).

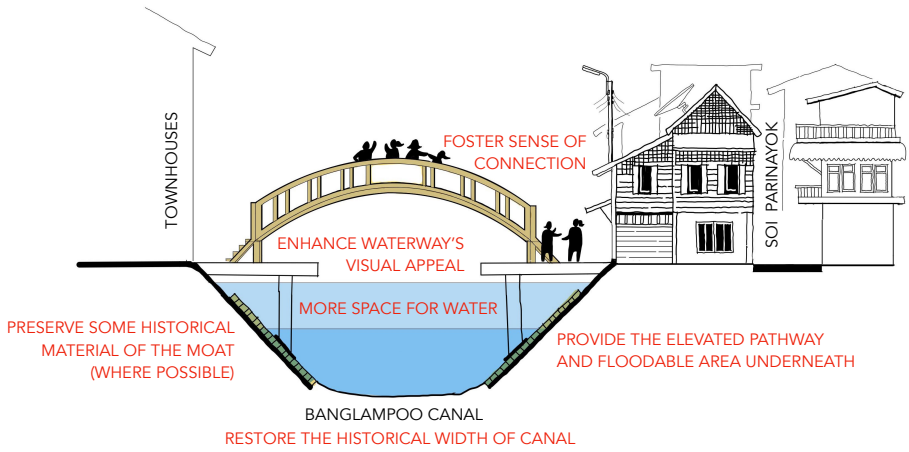


Fig 5-43: Floodable land use with heritage consideration being recommended in Banpantom (Table 5-1)

Interviewees recommended considering the relationship between people and waterways before any changes to the areas. They addressed that water management must consider enhancing the area's visual appeal and fostering a sense of connection with the water body, rather than concentrating solely on engineering capacity (EP-04/06/07/IA-08). RE recommended considering the local lifestyle dimension before making any change (RE-05/08/10) (Table 5-1).

> *"I believe that government-led development projects should align with the community's way of life. Any changes should take into account our daily activities. For example, in our historical commercial area, their [GA's] objectives should reflect the community's activities. It's crucial for them [GA] to understand our needs and tailor solutions accordingly." RE-10*

EP suggested that the embankment should be considered an acceptable structure only if needed for the particular area, rather than being a compulsory feature for every waterway. Furthermore, if these structures are required, their integration with the surrounding environment must be taken into account (EP-03/08/09/10).

> *"Why don't we develop the community based on its heritage value by simply enhancing it and trying not to change the historical context? […] The structure of embankment should be the last consideration in these areas. However, if it is truly necessary, it should respect the existing condition of the area" EP-09*

5.4.5 Highlight urban functionality

This section describes Scenario IV (Fig 5-45), which is a compilation of three management schemes (14)/(15)/(16) recommended by interviewees (depicted in Fig 5-44). The scenario highlights a focus on urban functionality to serve the capital city of Bangkok.

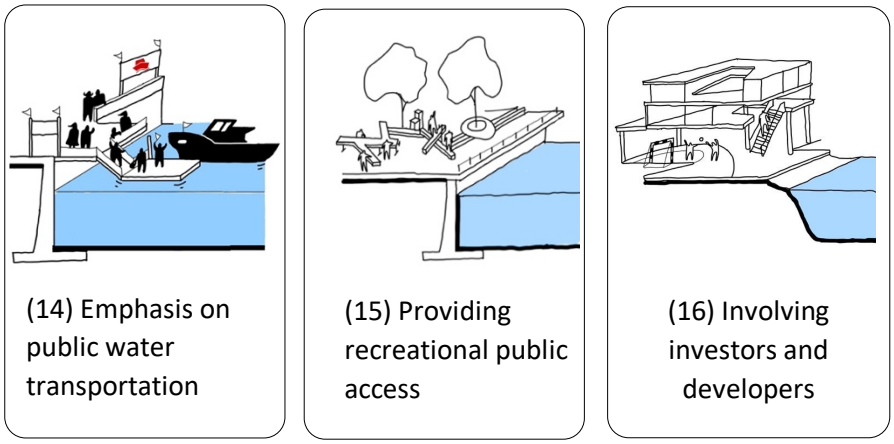


Fig 5-44: Three schemes representing Scenario V: Highlight urban functionality

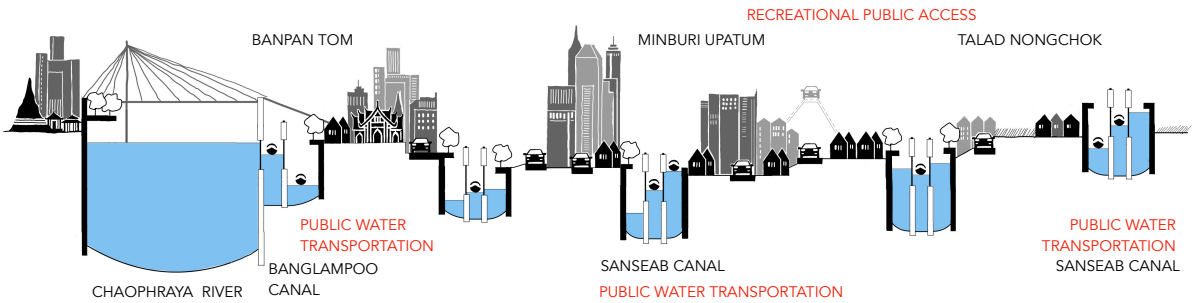


Fig 5-45: The eastern BUW's section diagram representing a scenario of "highlight urban functionality"

(14) Emphasis on public water transportation

EP advocated reviving boats as a fundamental mode of transportation, particularly in historical areas, to enhance public recognition and appreciation of the BUW (EP-09/10). Interviewees presented the cost advantages of the boat route along the Sanseab Canal, especially for different demographics, and supported the recommendation for continuous water transportation provision and expansion (EP-01/03/08/IA-09).

> *"Although the BTS Skytrain is expanding the city, boat transportation remains significant for those who cannot afford the higher cost of train. The use of the BTS Skytrain and boats differ in both income levels and the locations where they live" EP-01*

> *"The policy of increasing water transportation can restore the importance of the waterways to the people. While this may have both positive and negative impacts, such as increased noise and water pollution, it is still worth doing." EP-09*

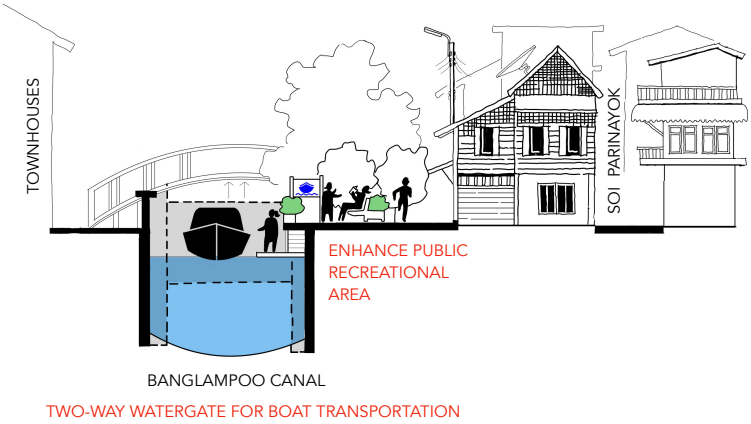


Fig 5-46: Highlight urban functionality as recommended in Banpantom (Table 5-1)

Interviewees recommended prioritising the adoption of electric boats because they require less intensive water-level control, result in reduced noise pollution, and minimise wave impact on structures along the BUW when operating (GA-05/06/EP-02). This should include necessary facilities, such as well-designed piers, to enhance functionality and ensure their proper locations to integrate with TOD, as in Minburi Area (EP-01/03) (Table 5-1).

(15) <u>Providing recreational public access</u>

EP presented the need to refurbish existing embankments that hinder the potential for recreational and public spaces adjacent to the waterways. They recommended acknowledging the urban functionality of creating public access points by enhancing connections among these areas along BUW (EP-01/05/07).

> *"The area along canals should be public access, establishing a connected and coherent network of linear spaces along BUW. This is particularly vital for locations near key social infrastructure such as schools, hospitals, or department stores, and could also facilitate the development of pedestrian walkways functioning as transportation routes." EP-01*

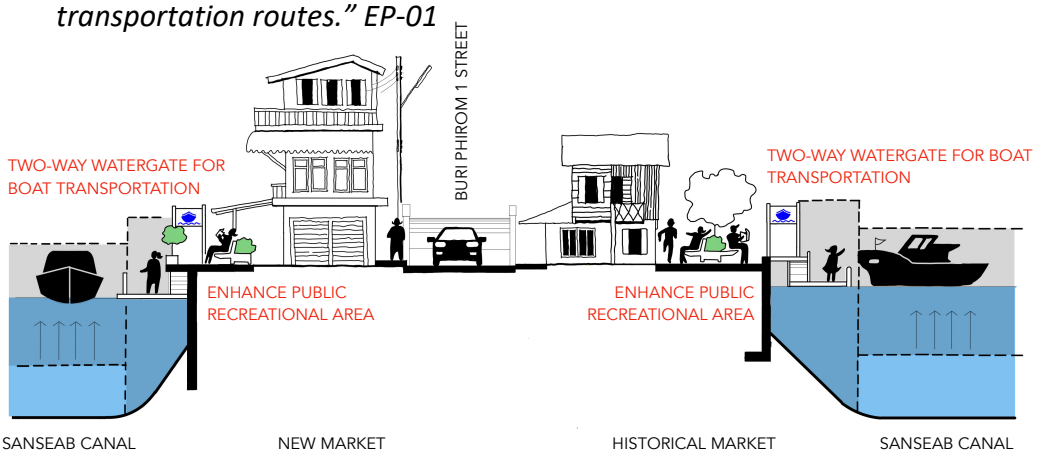


Fig 5-47: Highlight urban functionality as recommended in Talad Nongchok (Table 5-1)

GA suggested that areas along the BUW that are under public ownership could be designed to serve as linear green spaces, aligning with the urban pattern. They addressed that this network would not only enhance the urban landscape's aesthetic appeal but also provide accessible and dynamic areas for public use and recreation. This design transformation could

contribute to revitalising the BUW, turning it into a collection of lively and easily accessible urban spaces (GA-01/02/04/06).

> *"The waterways area can be developed to be used as public areas or green spaces. However, the water authority needs to adjust or change the structure of the current embankment. […] I think the main problem with the canals as part of the urban pattern is that the approach should be improved to provide more access for people to use as public space rather than just focusing on embankments." GA-02*

(16) <u>Involving investors and developers</u>

GA described that developer projects often progress more expeditiously due to their budgetary resources, such as department store. These commercial ventures establish public spaces along the riverside, enhancing the urban landscape (GA-04/06). The TPD interviewee described the engaged developers who owned department stores along the Sanseab Canal, inner Phratunam district, as an illustrative example of the potential for investor involvement (GA-02/06).

> *"Department stores could benefit from increased foot traffic accessing their investment while simultaneously contributing to the improvement of the orderliness and cleanliness of the areas along the BUW. They [developers] could subsidise the residents for moving away to run the construction as they have a capacity of the budget." GA-06*

EP suggested an example of investment strategies that government authorities could adopt to guide the development of areas along the BUW and serve examples of implementation (EP-04/08).

> *"The potential of investing in projects for residential or commercial spaces along the BUW could be convinced by government authorities to developers, encouraging them to utilise innovative techniques such as floating structures or dual-purpose functionality. These could be examples serve as quick illustrations to showcase potential directions for development." EP-04*

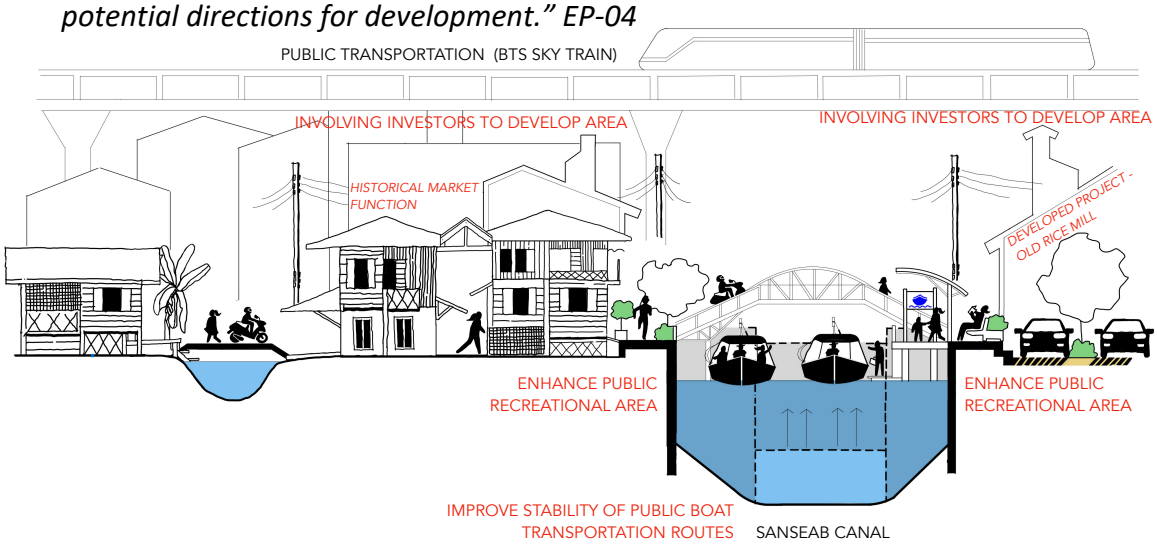


Fig 5-48: Highlight urban functionality as recommended in Minburi Upatum

5.5 Landscape value of waterways in Bangkok

5.5.1 Food production value

Historical value

RE in Banpantom addressed the historical value of the Banglampoo Canal, which served as the main waterway while they created minor waterways known as "*Lam Kradong*" to irrigate their land. These waterways supported tropical fruit gardens for local needs (RE-01/03/04).

> *"The water channels led water from the Banglampoo Canal to the gardens inside the community. The houses were built far away from each other because the areas between them were mango orchards, and small waterways ran through the areas." RE-01*

RE in Minburi Upatum discussed how, during flood seasons, elevated water levels from the waterways benefited rice production. Additionally, fishing activities occurred along the waterways using the traditional method known as "*Yok Yor"* (Fig 5-49 Right) (RE-04/05/06).

> *"The small channels had a water wheel or traditional impeller made from wood, which diverted water from the Sanseab Canal to the small channels. We could stop the wheel to stop water from flowing into the paddy field. The area over here [Minburi Upatum] was all paddy fields. […] The type of rice that grows here could prevent floods because its height is more than 2 m. […] The children loved to catch shrimp in the waterways." RE-05*

RE in Talad Nongchok described how their household edible gardens and rice cultivation were significantly linked to the waterways. They noted that edible gardens often planted alongside the waterways included edible aquatic plants. The waterways served as irrigation channels for plantations, with the added value of providing fish and other aquatic animals for consumption throughout the year (RE-08/09/10) (Appendix 3F).

Current value

This value in current times was revealed by interviewees who noted that, in Bangkok, much of the agricultural landscape has transitioned into urban areas, leading to a decline in food production value (EP-03/09/10) (Appendix 3F).

RE in Talad Nongchok said they continue to use water for irrigation, and water quality remains acceptable for aquatic animal consumption. They mentioned that edible gardens are still being cultivated near houses along the Sanseab Canal, and aquatic animal-catching activities persist in areas where recent flood dike construction has not reached (RE-09/10).

> *"Along the canal, there are farmers' residences adorned with edible gardens featuring banana trees, zucchinis, morning glories, and more. […] Further along, the fishermen discovered scallops. […] The area also boasts…eggplants, mulberries, mangoes, and olive trees, all grown directly in the soil rather than in pots." RE-1*



Fig 5-49: The edible plantation (Left), and traditional *Yok Yor* fishing method (Right) in Talad Nongchok

RE in Talad Nongchok mentioned that after embankment construction, farmers in the area had to request that the contractor open gaps along the embankment to allow water to flow through minor waterways to their farmland, while some requirements needed the use of pumps instead (RE-08) (Appendix 3F).

RE presented that in Minburi Upatum, the food production value from the Sanseab Canal persists in the form of fishing activities, despite the difficulty in accessing the waterway, which is hindered by embankment structures. They described that individuals often release fish caught in this area as part of Buddhist merit activities. However, the inedibility of fish sourced from the waterway can be attributed to deficient water quality (RE-04/05/06).

EP addressed that the irrigation channel or minor waterways lacked official documentation due to what was considered their limited value by public authorities. This contrasted with larger-scale waterway excavations conducted to facilitate mass food production, exemplified by the aims of the Rangsit Project (EP-02) (Appendix 3F).

5.5.2 Daily consumption value

Historical value

RE from three communities described that they historically used water from waterways for their daily needs prior to the establishment of formal waterworks like Prapa (RE-01/02/05/06/08/09/10).

> *"We relied on waterways to meet our daily water needs. […] We would scoop water from the waterways during the nighttime or early morning, which was crucial because it corresponded to the period when tidal conditions were favourable- easy to reach." RE-01*

> *"The water in the waterway was very clean. I remember that I used to scoop water from the canal in an 'Ong' [ceramic bowl], then put alum inside to make the water transparent and use it for bathing. If I wanted to drink, I had to boil it first. Rainwater was the best source for drinking. […] Since there was never a freshwater operation, people used water from the waterways. […] These waterways were used for bathing, washing clothes, crafting process, and orchard irrigation." RE-04*

Current value

RE from Nongchok described that even with the introduction of such waterworks, waterways still hold importance for daily consumption, such as for outdoor chores like washing dishes or dusters (Fig 5-50) (RE-08/09/10). They mentioned that they no longer have any access to the waterbody after the embankment construction.

> *"…plant watering, cleaning, fishing, and irrigating paddy fields are hindered, and we have to pay more for water services." RE-10*

> *"The residents in the Nongchok Area utilise both the Phrapa [waterwork] and water from the Sanseab Canal. However, after the embankment construction, access to the canal was blocked. In turn, some houses have begun using pipes to redirect water from the Sanseab Canal for their needs." RE-08*



Fig 5-50: Sanseab Canal's daily consumption of washing dishes in Talad Nongchok

RE from Minburi Upatum mentioned that they normally use water from the Sanseab Canal for watering plantations. However, due to the presence of embankments and railings along the canal, they are compelled to use pipes and pumps to redirect the water (RE-04/05) (Appendix 3F).

5.5.3 Transportation value

Historical value

Interviewees described that waterways served as vital channels for movement in their earliest settlement. The minor waterways were akin to alleys, or "*Soi*" in Thai, providing pathways adjacent to houses, while the major waterways served as principal routes connecting important locations (EP-03/09/10, GA-05/07). EP described the process of managing watergates to maintain the proper water level for boat transportation historically.

> *"They [public authorities] had a watergate at the mouth of the canals, which they would open to allow boats to enter the area (the historical canals). Even when the water level in the river was low, the water in the canals remained sufficient for boat transportation. They were well aware of the tidal conditions and effectively managed the watergate to facilitate water transportation." (EP-02)*

RE in Banpantom described that historically, the function of waterways extending beyond the Banglampoo Canal as a transportation route. A network of minor waterways traversed the

land owned by villagers, adding to the complexity of the water-based transportation system. They revealed that the Banglampoo Canal facilitated various boat transport routes and the delivery of goods (RE-01/02/03).

> *"Paddle boats used to sell mangoes, with gardeners paddling their boats from Thonburi to the Wonchart market pier, where they sold their fruits to merchants. Additionally, other boats arrived here to sell various goods, while some transported teak to the sawmills. […] Large ships also navigated through, towing other boats and guiding them to transport products to the Mahanak Market." RE-01*

RE in Minburi Upatum described how the minor waterways were integral to the landscape, giving the impression of the community being surrounded by small water channels, almost like an island. They made use of these waterways as convenient access points. Each house had its own pier, allowing boats to navigate through the minor waterways, drop off goods, and served as parking spaces for boats. The convergence of major canals also served as hubs or transitional areas (RE-05/06/07).

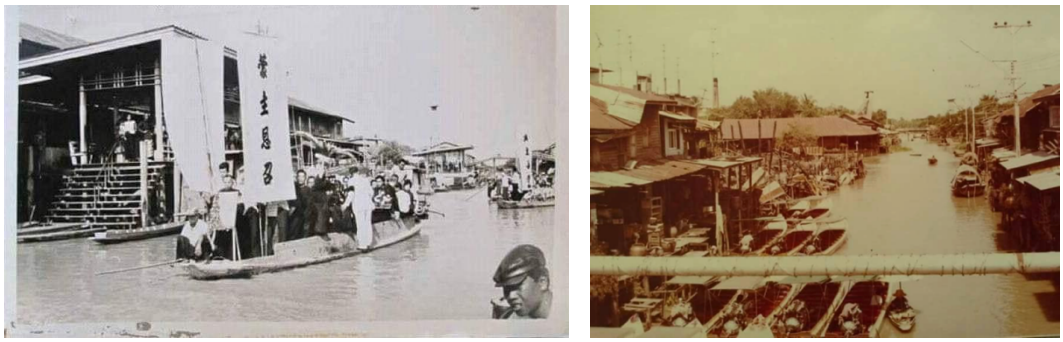


Fig 5-51: Historical use of boats along Sanseab Canal in Talad Nongchok (RE-09)

RE in Talad Nongchok mentioned that the Sanseab Canal in this area assumed a significant role in transportation, acting as a primary route that connects to the Bangpakong River (Fig 5-51). Specific events, such as funerals, demonstrated the crucial role of boats in transporting the deceased from their residences to the nearby temple graveyard in the Nongchok Area (Fig 5-51 Left) (RE-08/09/10). They described how various private boats served distinct functions based on their design and capabilities.

> *"Every household along the waterways had their own boats, either paddle or engine-powered. The engine boats, known as 'E-Pah', were smaller in size and used for longer distances compared to paddle boats. These small engine-powered boats were typically 6-7 meters long and accommodated one person per row. […] Boats were commonly employed for transporting logs and teak until water gates were installed at Sanseab and Khlong Sibsam Canal." RE-08*

Current value

In modern times, the current value of the BUW for transportation has significantly decreased (IA-08/09/EP-03/04). EP observed that Bangkok's people using the public boats on the Sanseab route often do so out of necessity rather than choice (EP-05/07). Existing boats, mainly in the Old Town, tend to serve tourists rather than support public transport, e.g. at the Bangkok Noi Canal (EP-03/04). The current management has prioritised the use of cars over boats as a means of transportation (EP-01/03/07).

> *"The newly constructed roads with bridges lack elevation to accommodate boat passage through canals. This design prioritises smooth vehicular flow, minimising slopes to facilitate faster car travel. Consequently, boats face difficulties passing under these bridges, including the one crossing the Sanseab Canal at Phratunam. In contrast, older developments like the Hua Change Bridge retain elevated levels to allow boats to pass underneath." EP-01*

RE from Talad Nongchok described that they still use the local boats for short distances. (Fig 5-52 Right). They mentioned that the construction of recent flood dikes has introduced challenges, impeding their ability to dock boats and access land due to the elevated embankments. For example, they highlighted the situation at Saint School in Nongchok, where they had to construct temporary stairs themselves to facilitate boat access (RE-08/09/10) (refer to Fig 5-16).



Fig 5-52: The use of boats in Sanseab Canal in Nongchok Area
Source: https://www.facebook.com/p/ตลาด-100-ปี-หนองจอก- accessed July 2022

5.5.4 Ecological/ biodiversity value

Historical value

EP pointed out that historically, the natural water flow in waterways facilitated a balanced cycle of organisms (EP-06). The banks of waterways were especially vital to the natural system, where areas prone to being submerged during high-water levels provided fertile ground for ecological cycles (EP-02). Historical waterways did not require embankments for erosion protection, primarily due to natural vegetation covering the banks (EP-02/06). This vegetation also contributed to the filtration of the water, improving its quality. The intricate interplay between water, plants, and wildlife within the network of waterway ecosystems maintained their health and vitality (EP-02/06/03/09/10).

"During October or November, saltwater from the ocean used to influence the waterways in southern Bangkok, such as the Tungkru Area, leading to the presence of mud keeper fish, jellyfish, sea catfish, and other marine life. However, these sightings have become rare in recent times. Additionally, brackish vegetation like the Klack tree (mangrove) has disappeared, along with its characteristic root system anchored the soil along the water's edge." EP-09

EP described that while the Banglampoo Canal's banks were initially paved with materials during the city's establishment as one of the historical moats, sediment flow through the water contributed to the gradual covering of these banks when the initial village settlement occurred, including the community of Banpantom (EP-03/09/10). RE told that historically, native vegetation, including the Banglampoo tree (Fig 5-53), flourished along the banks of the Banglampoo Canal (RE-02/03/04).

"The houses situated along the Banglampoo Canal once bordered the soil bank, adorned with plantations like the Crok tree [known as Lampoo in Thai] and Indian Oak [Barringtonia acutangular]. Numerous Crok trees lined the canal, particularly near its mouth where it joined the river, inspiring the name BangLampoo Canal due to the abundance of Lampoo trees. […] Fireflies inhabited these Crok trees, creating a mesmerising sight at night. I have a memory of paddling with my mother to the shrine in the evening, marvelling at the beauty of these fireflies as we returned home." RE-03



Fig 5-53 The Banglampoo Tree along the Chao Phraya River, later perished subsequent to the 2011 flood, Source: http://banglamphumuseum.treasury.go.th accessed April 2024

Minburi Upatum residents mentioned that this rich ecosystem fostered an abundant fish population due to the availability of aquatic plant roots, which provided habitats where the fish could breed and lay eggs undisturbed (RE-05/06/07).

Current value

Interviewees claimed that the ecological value of BUW has significantly declined to the point where it is now barely noticeable. The manipulation and obstruction of waterway flows have transformed the BUW into drainage channels that lack their once-prominent natural landscapes (EP-01/02/03/06/IA-08). RE in Minburi Upatum mentioned that the construction of embankments has blocked the minor waterways (Fig 5-10-Left), stalling water flow and

rendering the plantations ineffective (RE-05/07). RE in Talad Nongchok mentioned that after the embankments were constructed in their community, the presence of plantations within the waterways was erased, and the natural banks have been eroded (RE-08/09/10) (Fig-5-2-Left).

5.5.5 Livelihood value

Historical value

Interviewees highlighted that waterways within the inner areas historically held significance for artisanal villages (EP-03/10). RE from Banpantom described an example of crafting activities involving nielloware, primarily serving the needs of the palace. They described the necessity of water resources from waterways to support crafting procedures, with workers and employees needing to facilitate processes such as loading water from the canal (RE-01/03/04).

> *"This technique of nielloware-making was complicated to craft. Our king used to give this decoration souvenir to the King of France.[…] Many houses sculpted the Tao Poon (betel box). They crafted the decorated tray along the BannLor Canal— the crafting process needed to be located near the water resource. In the BannPan village, which was not near waterways, villagers hired workers to dig the ponds or load water from the Banglampoo Canal." RE-01*

RE in Minburi Upatum and Talad Nongchok presented the historical significance of the Sanseab Canal in facilitating a diverse range of activities centred around commerce in their region. This canal was crucial in sustaining the livelihoods of individuals and the neighbourhood as a whole (RE-05/06/07/08/09/10).

> *"Here, the wooden row houses functioned as shops selling various goods, such as fish-source, garlic, rice, chilli, gold, sardine, Chinese medicines, and ice. This location could have been quite chaotic, with hotels and theatres also present. Some boats would pass by or stop here, allowing people to buy products directly from their boats without disembarking. [...] Individuals from other areas could cross the bridge to purchase items here. [...] Historically, there were no department stores, so grocery stores were required for everyone." RE-06*

Current value

EP indicated that the livelihoods values associated with waterways diminished during later stages of urban modernisation (EP-03/09/10). In Banpantom, RE mentioned that they utilise space adjacent to the Banglampoo Canal for their local merchant, which is proposed for removal according to an order from DIO (RE-01/02/03) (Fig 5-54). In Talad Nongchok, RE expressed gratitude for having their own houses along the Sanseab Canal for conducting local business, but there is an order from the DSD to demolish their houses to construct an embankment (RE-08/09).



Fig 5-54: Local merchant along the walkway adjacent to Banglampoo Canal in Banpantom: proposed to be removed by the DIO

5.5.6 Favourable settlement value

Historical value

EP described the waterways, historically used as moats, as playing a vital role in the city's defence strategy, often serving as protective barriers. They noted that historically, settling near waterways was considered the most favourable location (EP-09/10).

> *"Areas along waterways were priority spaces that historical people would select for settlement. Being close to the waterbody provided many benefits. It's not surprising that historical waterways were typical associated with traditional communities living nearby." EP-10*

RE described the historical significance of the waterways in fulfilling the needs of even the most modest residential enclaves in their vicinity, with the Lamrang acting as territorial markers or boundaries (RE/02/04/07).

> *"We dug small waterways around our houses. We parked our boats in our territory [of waterways], which helped prevent them from being stolen. We built small bridges for use, and we elevated the bridges in the evening to prevent access from outsiders. The small waterways served as our fences." RE-07*

Current value

EP presented that this value has currently vanished, as people no longer seek to establish their residences or properties close to the waterways (EP-03/09/10). Interviewees noted the occurrence of urban fragmentation in development, partly attributed to the waterways that traverse the landscape and disrupt connectivity between adjacent properties, which is different from people's preference for streets (EP-01/GA-02).

> *"When looking at urban development and BUW themselves, they [waterways] usually fragment the urban pattern. […] Urban development always faces problems in areas adjacent to the BUW. They are similar to streets with linear space- yes- but without access, rather preventing accessibility. […] When developers have lands adjacent to the BUW, they normally feel unhappy." GA-02*

5.5.7 Day-to-day cultural value

EP described how Thai people's lifestyles have long been intertwined with waterways (EP-03/09/10). The day-to-day cultural value of areas along waterways was evident through the temples, which served as central hubs for neighbourhoods and formal shared public spaces. These temples were surrounded by small waterways that were effectively managed, bringing people together (EP-03/09). RE described their embedded physical and intangible relationship with waterways, noting that water from these waterways was used for almost everything in their lives (RE-08/09/10) (Appendix 3F).

> *"I have seen this [Sanseab] canal since I was born- playing, bathing, paddling, relaxing. We couldn't live without the canal. I used to see tons of boats traveling past, including the one transporting the body to the graveyard at Hajimina Mosque (RE-09)* (see Fig 5-51-Left).

> *"I used to paddle the boat with my mother to the shrine in the evening and saw the fireflies when we headed back to our house. […] This was a very long time ago- I still remember it. […] My mom asked my brother to scoop the water and fill in the 'Ong' every day. […] We used to do crafting with water… we had the mango garden irrigated by the small waterways nearby our houses." RE-02*

5.5.8 Preservation value

GA noted that certain waterways, particularly in the context Old Town Bangkok, have gained significance as repositories of intangible significance. They indicated that the historical canals are officially registered as protected elements, signifying their importance in preserving historical value (GA-02/05/07). These preserved spaces also attract visitors and enhance tourist attractions (GA/05).

> *"The inner area is surrounded by historical architecture or buildings, including the area across the Chao Phraya River in Thonburi. These sites also include the construction of canals in their history and are areas we need to preserve." GA-02*

RE in Banpantom described the waterways as historical evidence deserving preservation for younger generations (RE-04). EP presented that government projects aim to value the waterway both as a preservation asset and an economic resource, with a primary focus on developing it as a tourist attraction. Their plans prioritise visitors as key assets for boosting economic development (EP-01/03/08/10).

Interviewees noted that historical settlers often held strong beliefs regarding waterways, attaching significant value to the natural resources they provided. These beliefs helped prevent disturbances to the waterways, thereby contributing to their preservation and high value (EP-04/IA-08).

> *"The waterways provide people with high historical significance because they represent historical knowledge. Humans created this waterways system long ago.*

[…] The archaeological evidence found in these historical canals holds significant value, providing insights into the chronology of the area." IA-08

5.5.9 Local recreation value

RE in Banpantom highlighted the historical benefits of Banglampoo Canal and other *Lamrangs* for recreational activities and play during the residents' childhoods. Activities included swimming and exploring aquatic plants, particularly during periods of higher water levels and inundation (RE-01/02/04).

"Fifty years ago, the water in the canal was very high, almost reaching the first floors of the houses. We could sit down and put our legs into the water. [...] There were rented paddle boats available, and we could rent them to paddle in the canal. […] The children used the waterways as their playgrounds. Many trees grew along the canal banks, along with aquatic plants and long grass. Kids used these for playing." RE-02

In Talad Nongchok, shared wooden terraces adjacent to the Sanseab Canal emerged as leisure areas for the community, serving as shared spaces (RE-08/09) (Fig 5-55). RE in Minburi Upatum characterised terraces and pavilions along the Sanseab Canal as communal spaces where locals spent time. The waterways and rice fields, especially after harvest, were identified as play areas for children within the community (RE-05) (Appendix 3F).



Fig 5-55: The accessibility for locals to enjoy Sanseab Canal (RE-09)

5.5.10 Urban public space value

Interviewees described that due to the proliferation of densely populated urban areas, spaces along the BUW have become increasingly valuable as public spaces (GA-02/06/ EP-01/05). GA interviewees described their initiatives to create public spaces along the BUW, encompassing all three communities adjacent to the waterways.

"We do try to provide public accessibility along the BUW as a means to seamlessly use these areas for recreation for the urban people." GA-06

Interviewees underlined that areas along waterways, especially those incorporating greenery, provide resources that can significantly contribute to the well-being of urban people (IA-09, EP-01/05).

> *"People are delighted to have outdoor spaces, particularly those located alongside the waterways. People fundamentally require places for relaxation and recreation. The waterways, especially when they support biodiversity, can help individuals manage stress, enhance their overall well-being, and even improve mental health. These benefits are invaluable and cannot be quantified solely in monetary terms." EP-01*

RE in Minburi Upatum described the function of walkways along the Sanseab Canal in the neighbourhood, noting that they serve as a shortcut to the public transportation system (RE-05/06).

> *"I must note that most pedestrians in this area are not making productive use of the walkways—actually, the majority are not. But the pathways near the bridge that connect to a parking lot via the main road are beneficial. People utilise this route to save time when accessing the BTS [Skytrain], public buses, vans, and the new boat route here." RE-06*

5.5.11 Natural inundation value

In Minburi Upatum and Talad Nongchok, RE described how water is confined in the area during flood seasons, benefiting rice cultivation. This, in turn, provides locals with increased access to fish and aquatic life, serving as nourishment as the present of inundation (RE-05/06/08/10).

> *"Historically, when there were no watergates, the water level would rise and fall naturally, especially during the rainy season. The water level would almost reach of the community but would not flood and cause any disaster. There were small channels connected to the canals, which would flow inside the area. When the water level rose, the small channel would receive the water." RE-06*

In Banpantom, RE illustrated how higher water levels facilitated easier access to the waterbody, which particularly beneficial during crafting activities in history (RE-01/02). The inundation period was also highly anticipated throughout the year, as RE mentioned it offered children the opportunity to play in the water, jump in, and climb up from the banks more easily (RE-03). EP described the significant inundation that occurred during December, when people celebrated Loy Kratong, and noted that it also benefits the living system (EP-06/IA-08).

> *"During December, the water level normally rise and inundate the banks of waterways. The water would bring eggs of small animals from other places, helping to maintain the ecological balance. When the flood receded, the animals would grow and thrive in the system." EP-06*

5.5.12 Flood prevention value

Drainage role

Interviewees valued the drainage role of waterways in the current urban setting, with the primary aim being to facilitate the rapid outflow of water from a given area. This perspective often leads to the belief that controlling and enhancing the BUW to promote fast water flow is imperative (EP-04, GA-03/04). EP clarified that the BUW typically has a gentle slope and thus exhibits slow water movement. Introducing structures (Fig 5-56) to augment flow speed and direct water courses becomes essential (EP-04). Maintaining lower water levels on an ongoing basis is also described as a strategy to increase BUW's capacity for drainage (GA-04).

> *"The waterways help a lot to [address] the flood issue. We use them to bypass water out of the urban area. But you need to understand the nature of the waterways in Bangkok, which are flat. This means the water will flow slowly, not quickly. We really need to use the help from pumping and other structures." GA-04*



Fig 5-56: Pumps at the watergate in Sanseab Canal nearby Talad Nongchok (Left), Pumping station in conservation canal at Pakkhlong Talad (Right)

Detention role

The value of BUW as detention areas was presented by EP, involving the notion that these waterways can effectively contain larger volumes of water during the flood season, thereby averting the impact on urban regions (EP-02/08). EP elaborated that with the reduction in green spaces in urban areas, the BUW can serve as areas for water absorption. The BUW's role as detention area is feasible, enabling a gradual water flow that is characteristic of flat terrain with extensive waterways (EP-02/03). The value of the BUW as detention spaces with a gradual flow confers certain benefits in terms of delaying the impact of flooding (IA-08).

> *"This is because the waterways could help delay the flow as retention area. Residents in Ayuttaya [An antique town in northern Bangkok] told me that they have plenty of time, around 6 hours, to leave their houses as the water naturally reaches the lowest points of the waterways first." IA-08*

In Talad Nongchok, RE mentioned their community remained unflooded during the city's major flood incidents. The water level in Sanseab Canal decreases quickly after almost reaching the floor (RE-08/09/10). Interviewees described that one contributing factor was the plentiful spaces, including the agricultural areas and minor waterways, that allowed water to be contained rather than inundating the community (RE-08/EP-02/08/09).

Summary

Landscape value of BUW	Past	Current
Food production value	/	/ (lacking)
Daily consumption value	/	/ (lacking)
Transportation value	/	/ (lacking)
Ecological/ biodiversity value	/	X
Livelihood value	/	X
Favourable settlement value	/	X
Day-to-day cultural value	/	X
Preservation value	X	/
Local recreation value	/	X
Urban public space value	X	/
Natural inundation value	/	X
Flood prevention value	X	/

/ referenced / (lacking) referenced in the context of lacking X no referenced

Table 5-2 The value stakeholders attribute to the historical and current context

Table 5-2 shows the values around BUW referenced by stakeholders in the past (historical) and current contexts. To illustrate, food production, daily consumption, and transportation were referenced in both but with diminishing value in the current BUW context. Ecological, livelihood, and favourable settlement values were referenced only historically, with their absence in the current context. Meanwhile, preservation, urban public scape, and flood prevention values were described in the current BUW's context but not in the current context. Conversely, day-to-day cultural, local recreation, and natural inundation values were described only in the historical context of BUW.

Landscape value of BUW	Government agencies (GA)	Residents (RE)	Experts and international agencies (EP/IA)
Food production value			
Daily consumption value			
Transportation value			
Ecological/ biodiversity value			
Livelihood value			
Favourable settlement value			
Day-to-day cultural value			
Preservation value			
Local recreation value			
Urban public space value			
Natural inundation value			
Flood prevention value			

Extensively referenced Moderately referenced Not referenced

Table 5-3 The relationship of landscape value and the stakeholders' references

Table 5-3 illustrates how stakeholders engaged with BUW in various capacities. RE fully embraced all BUW values, particularly those related to food production, daily consumption, transportation, and livelihoods. Similarly, EP and IA recognised BUW values but excluded daily consumption and local recreational value. They extensively emphasised food production, transportation, favourable settlement, and flood prevention. Meanwhile, GA acknowledged values of food production, transportation, flood prevention, preservation, and urban public space. Their presence, absence, and interpretation of BUW values among stakeholders are shown in Table 5-4, representing the differentiation in valued landscapes from various actors.

BUW's value	Government agencies (GA)	Residents (RE)	Experts and international agencies (EP/IA)
Food production value	Benefits for large-scale food production through massive canalisation or irrigation projects.	Benefits household food production, i.e., kitchen gardens, through irrigation channels, both major and minor waterways.	Benefits both to local and city scales. Irrigation channels normally lack acknowledgment from authorities compared to the major canals.
Daily consumption value	-	Benefits for everyday use, such as washing dishes or duster, and watering plants or gardens.	-
Transportation value	Rivers and major canals serve as mass transit transportation systems.	Waterways support short-distances transport via local boats, functioning through both major and minor canals.	Significant since history for the use of watergates to facilitate water-level for boat usage. It remains significant in the urban context as it serves a wider range of demographics.
Ecological/ biodiversity value	-	A variety of vegetations along the waterway' s banks helps prevent erosion. Waterways serve abundant fish populations.	Balance the cycle of organism with the ecological cycle, filtrate water to improve water quality and provide erosion protection.
Livelihood value	-	Areas surrounding waterways support occupations and income sources for living, such as market activities.	Waterways are embedded to people's occupations, e.g., the artisan villages along the historical waterways, market villages along major waterways.
Favourable settlement value	-	Waterways serve as boundaries and affect accessibility for houses.	Waterways serve as a city defence strategy/ protection. Area adjacent to waterways were favourable locations for residents.
Day-to-day cultural value	-	The embedded relationship with waterways adds value of everyday activities and creates both physical and intangible memories.	The relationship between people and waterways is intangible values. Local temples with waterways around them serve as physical examples, where people gather and engage in activities.
Preservation value	Historical waterways are significant monuments that can attract visitors and enhance tourism.	Historical significance for younger generations.	Historical waterways represent historical knowledge and serve as archaeological evidence. They are significant for preservation.
Local recreational value	-	Places for children to play, as well as spaces for leisure and community gathering.	-
Urban public space value	Public access along waterways benefits urban people.	Shortcut route to access other nodes, including public transportation.	Waterways with green areas contribute to the well-being of urban people.
Natural inundation value	-	Serve aquatic life, irrigated garden, spaces for playing and festivals. The high water level was easily accessible.	Benefits for living system and agricultural activities.
Flood prevention value	Main waterways are the free flow drainage channel	Minor waterways allowed water to be contained rather than inundating the community	Flat terrain of BUW require the structure measure to enhance the drainage capacity. BUW can act as the water absorption with gradual flow.

Table 5-4 The similarity and differentiation of stakeholders in interpreting values in BUW

5.6 Value manifested in relation to urban waterway management

This section elaborates on how policies and planning strategies for BUW management reflect the landscape values addressed by stakeholders. Table 5-5 presents an analysis of plans and policy documents related to BUW and three community projects discussed in Chapter 4 (see policy discourse in Appendix 2A/2H/2I/2J).

Landscape value of waterways / Policies and plans relating BUW and three communities	Food production value	Daily consumption value	Transportation value	Ecological/biodiversity value	Livelihood value	Favourable settlement value	Day-to-day cultural value	Preservation value	Local recreation value	Urban public space value	Natural inundation value	Flood prevention value
Rattanakosin Plans 1994, 1997 by ONEP			■					■		■		
Rattanakosin Plan 2020 by ONEP			■					■		■		
Heritage Corridor, Banglampoo Canal 2016 by TPD			■					■		■		
Khlong Rob Krung Redevelopment Projects 2017 by TPD			■					■		■		
Redevelopment plan in Minburi 1997 by TPD			■					■		■		■
Redevelopment plan in Minburi Upatum 2014 by TPD			■					■		■		■
Redevelopment plan in Minburi District 2020 by TPD			■					■		■		■
The Reclamation of Sanseab Canal 2021 by OWNR			■	■								■
Redevelopment plan in Nongchok 1997 by TPD			■					■				■
Chao Phraya Development Plan 2016 by PWD								■		■		
City Planning Annual Reports 2015-2020 by TPD			■							■		■
The Comprehensive Plan (draft) 2020s by TPD	■		■							■		■
Road Rail Boat Policy 2020 by DSD			■									
Flood prevention plans 2007-2020 by DSD										■		■
Plan of increasing drainage capacity 2015 by DSD&CODI										■		■
The Delta Flood management policy 2013 by JICA												■
Bangkok Resilience Strategy 2017 by BMA			■							■		■
The 20 years of water management policy 2018 by ONWR			■	■				■				■

■ referenced □ Not referenced

Table 5-5 The relationship between policy documents and landscape value of BUW

To illustrate, these policies involving BUW recognised the importance of transportation, food production, urban public space, preservation, and flood prevention values, similar to what was conveyed by GA interviewees (Table 5-3). Meanwhile, the ONWR's policies acknowledged the ecological value, while GA interviewees did not address this value. The values expressed only by RE, namely daily consumption and local recreation, were not recognised in any of the policies considered. Neither were the day-to-day cultural value, natural inundation, livelihood value, and favourable settlement recognised, which were being addressed by RE/IA/EP.

Landscape value of BUW / Desirable change of BUW	Food production value	Daily consumption value	Transportation value	Ecological/biodiversity value	Livelihood value	Favourable settlement value	Day-to-day cultural value	Preservation value	Local recreation value	Urban public space value	Natural inundation value	Flood prevention value
[I] Enhanced ongoing management												
[II] Natural restoration												
[III] Prioritising benefits for locals												
[IV] Floodable land use/heritage consideration												
[V] Highlight urban functionality												

Extensively referenced Moderately referenced Not referenced

Table 5-6 The relationship between 'Landscape value' and 'Desirable change'

Table 5-6 demonstrates value articulated from desirable change scenarios (Section 5.4). It reveals the 'flood prevention value' emerges across all scenarios. This value is extensively referenced within the 'enhancing ongoing management' and 'natural restoration'. Certain values are unique to specific scenarios from the individual interview. For instance, the 'ecological value' is exclusive to the context of 'natural restoration', 'local recreation value' and 'livelihood value' is only in the scenario of 'prioritising benefits for local', 'preservation value' and 'favourable settlement' is only in the scenario of 'floodable land use with heritage consideration'.

This chapter comprehends the findings from interviews, addressing the landscape changes in BUW (Section 5.2), indicating the influence of governance to BUW's change (Section 5.3). The chapter further outlines various stakeholder recommendations (Section 5.4) and the values they hold and interpreted (Section 5.5). It delves into how these values are reflected in policy and management strategies (Section 5.6). These empirical findings are discussed further in Chapter 7. The findings from the focus group activities will be presented in more detail next.

Chapter 6
Values and knowledge in decision-making of BUW management

6.1 Introduction

The chapter calls on the focus group activities divided into three sections. Section 6.2 examines how stakeholders express values in the decision-making of BUW management, providing a comprehensive understanding of landscape value in management individually and collaboratively (RQ2.3/3.1). Section 6.3 presents the shared expertise/visions from workshops, which integrate experts from different areas working together in the context of BUW (RQ 3.1/3.2/3.3). Section 6.4 delves into the prioritisation of management concerning the BUW, exploring the reasons in decision-making and highlighting the challenges that might hinder improvements in BUW management (RQ3.2/3.3). Section 6.5 further gives an overview of challenges in decision-making from the participants' roles (RQ3.3).

6.2 The values held in decision-making process

6.2.1 Three types of values transformation

According to the findings presented in Section 5.5 Chapter 5, three types of landscape values of waterways in Bangkok can be clustered (refer to Table 5-2). Firstly, **(1) the diminishing value** provides insights into the process through which the decline in landscape value has manifested, and little persists in BUW. These include food production, daily consumption, and transportation values.

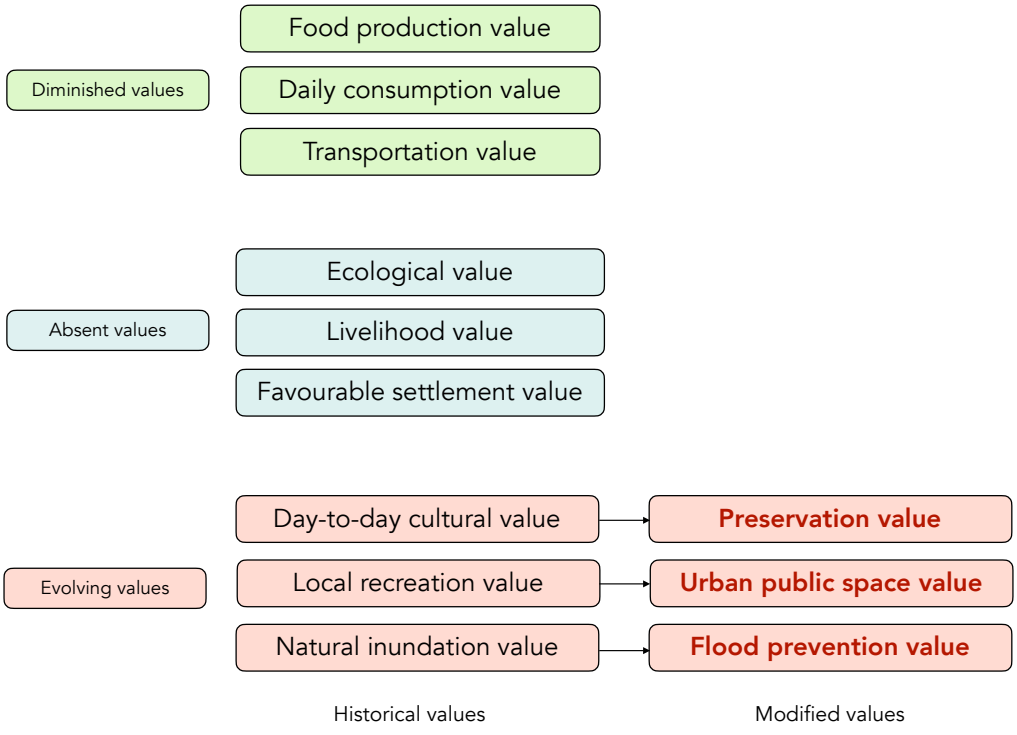


Fig 6-1 Diagram of three types of landscape values of BUW

Secondly, **(2) the absent values** are those held historically associated with waterways, and no longer exist in BUW in modern times. These include ecological value, livelihood value, and favourable settlement values. Lastly, **(3) the evolving values** focus on how the perceived value of BUW has undergone development or transformation to align with the requirements of the new urban environment. This includes the evolving of day-to-day cultural value into *preservation value*, local recreation value into *urban public space value*, and natural inundation value into *flood prevention value* (Fig 6-1).

		Document analysis	Individual interviews			Focus groups
		Policy documents (Table 5-5)	**Government agencies (GA)**	**Residents (RE)**	**Experts and international agencies (EP/IA)**	**Stakeholders collective focus**
Diminishing values	Food production value	/	/	/	/	/
	Daily consumption value			/		/
	Transportation value	/	/	/	/	/
Absent values	Ecological/biodiversity value	/		/	/	/
	Livelihood value			/	/	/
	Favourable settlement value			/	/	/
Evolving values	Day-to-day cultural value (historical)			/	/	/
	Preservation value (modified)	/	/	/	/	/
	Local recreation value (historical)			/		/
	Urban public space value (modified)	/	/	/	/	/
	Natural inundation value (historical)			/	/	/
	Flood prevention value (modified)	/	/	/	/	/

Table 6-1 Landscape value held about BUW in the data analysis

Table 6-1 summarises the findings from Tables 5-5 and 5-3, incorporating both policy documents and individual focus from Chapter 5, based on the researcher's observation regarding BUW's value in any capacity. The results from the focus groups are in the last column. The first column, policy documents, and the second column, GA focus, show that there were no references to evolving values in the historical versions instead of the modified versions. For example, preservation value was demonstrated in Rattanakosin Plans, while there was no evidence of day-to-day cultural value being expressed. The flood prevention plans by DSD expressed flood prevention value with no references to natural inundation value, while the redevelopment plans by TPD addressed urban public space value without acknowledging local recreational value.

6.2.2 Value from individual stakeholders' recommendations

Turning to the stakeholders' recommendations for desirable change, Table 5-6 reveals overlapping values when the matter was considered in groups. However, as individuals, their recommendations indicated single areas of expertise and certain values held, illustrating only specific areas of knowledge (Table 6-2). For instance, the scenario involving natural restoration did not address values such as daily consumption or livelihood values. Meanwhile, the scenario focusing on enhancing ongoing management only emphasised urban public space and flood prevention values, with various values being absent (Table 6-2).

Individual alternatives (five scenarios)

		[I]	[II]	[III]	[IV]	[V]
Diminishing value	Food production value					
	Daily consumption value					
	Transportation value					
Absent value	Ecological/ biodiversity value					
	Livelihood value					
	Favourable settlement value					
Evolving value	Day-to-day cultural value					
	Preservation value					
	Local recreation value					
	Urban public space value					
	Natural inundation value					
	Flood prevention					

Five scenarios
[I] Enhanced ongoing management
[II] Natural restoration
[III] Prioritising benefits for the locals
[IV] Floodable land use with heritage consideration
[V] Highlight urban functionality

Values expressed Values missing

Table 6-2 Values expressed about BUW by individual stakeholders (refer to Table 5-6)

6.2.3 Values from stakeholders' collaborative decision-making

The workshop activities, which involved bringing together diverse participants, showcase the diverse values expressed by experts as they held and integrated their collective recommendations through group discussion. Table 6-3 presents how individual tasks and workshops involved the expression of values in different manifestations. While each scenario concentrated on a specific area of expertise, the workshops demonstrated how different scenarios were integrated and developed or constructed into a shared recommendation, reflecting the diverse values held by participants.

Individual– values expressed according to single expertise	**Workshop – values emerging according to varied expertise**
Natural significant/non-human [II] -separated from- Heritage/human/historical dimension [IV] **Both sharing flood prevention value, neither addressing livelihood value**	Integrated: (6),(7),(12),(13),(4),(8),(9),(10) **Address various values** (see Table 6-4), **including ecosystem and adding livelihood value** Integrate both natural and heritage importance, while incorporating the local dimension. = Integrated historical and natural significance (Section 6.3.1)
Structure measure dependency [I] -separated from- Against structure measure [II] **Both sharing flood prevention value with the opposition of drainage and detention, various values missing** (see Table 6-2)	Integrated: (1),(2),(3),(4),(5),(6),(7),(10),(14) **Address various values** (see Table 6-4), **including ecosystem and adding transport/livelihood values** Combining both ideas depend on the suitability of the structure's use, considering urban functions and social dimension. = Considering structural measures in BUW (Section 6.3.2)
Considering heritage flexible land use [IV] -separated from- Urban function/ emphasis protection [V] **Absence of ecosystem and livelihood values**	Integrated: (6),(7),(12),(13),(14),(15) **Address additional ecosystem/livelihood values** Consider the dense land use and improve local infrastructure to support floodable areas and effectively control habitats. Apply floodable land use to public rather private properties. = Justification for adaptive land used (Section 6.3.3)
Urban function/ emphasis protection [V] -separated from- Considering locals request [III] **Both sharing flood prevention value, neither addressing ecological value**	Integrated: (8),(9),(11),(14),(15),(16) **Address various values** (see Table 6-4) Balance public benefits within the urban city while considering local dimensions. = Balancing benefit as a place of heritage (Section 6.3.4)

Five scenarios

[I] Enhanced ongoing management
[II] Natural restoration
[III] Prioritising benefits for the locals
[IV] Floodable land use with heritage consideration
[V] Highlight urban functionality

Sixteen schemes

(1) Boundary control and relocation improvements
(2) Increasing detention areas
(3) Improving structure capacity
(4) Improving wastewater treatment
(5) Improving garbage collection
(6) Restoring waterflow and network
(7) Restoring waterway bank
(8) Granting permission to inhabit and earn a livelihood
(9) Enabling access for routine consumption
(10) Equilibrating the operation of watergates
(11) Providing safety and security
(12) Floodable land use at the waterway edge
(13) Considering heritage or areas identity
(14) Emphasis on public water transportation
(15) Providing recreational public access
(16) Involving investors and developers

Table 6-3 The values addressing and areas of expertise in individual tasks and workshop (see Table 6-4 and Appendix 36/3H/3I)

6.3 Shared expertise/ shared vision

The workshop's findings present four collective sharing or shared expertise that address the complex situation of BUW and the three community contexts (Table 6-5). These insights emerged from the workshop exercises (see more in Appendix 3G/3H/3I). The participants addressed overlapping values (Table 6-4) in their discussion and developed shared visions.

	shared expertise in workshops / values held in decision-making	6.3.1 Integrated natural and historical significance	6.3.2 Considering structural measures in BUW	6.3.3 Justification of adaptive land used	6.3.4 Balance benefit as a place of heritage
Diminishing values	Food production value	■	■	■	■
	Daily consumption value	■		■	■
	Transportation value		■		■
Absent values	Ecological/ biodiversity value	■	■	■	
	Livelihood value	■	■	■	■
	Favourable settlement value	■		■	■
Evolving values	Day-to-day cultural value	■		■	■
	Preservation value	■		■	■
	Local recreation value	■	■	■	■
	Urban public space value		■	■	■
	Natural inundation value	■	■	■	■
	flood prevention value	■	■	■	■

■ Values expressed

Table 6-4: The values held in decision-making of workshop activities (see with Table 6-2)

6.3.1 Integrated natural and historical significance

The discussion from workshops revolved around two opposing perspectives: [II] emphasising natural significance (FE-02/04/07) and [IV] highlighting human significance through heritage consideration (HC-01/04/06). Both perspectives shared the goal of flood prevention value (Table 6-3). Workshop participants agreed that to fully harness BUW's potential for enhancing urban environments in Bangkok, management decisions should integrate historical context with environmental studies (G1/3/4/6/8). This integration was discussed across the three communities (Table 6-5).

> *"Banpantom and other conservation areas could be re-envisioned as more than just fully protected spaces from flooding through structural measures. Instead, these*

areas could play a role in mitigating the impact of floods and the consideration of waterways restoration. […] This can be integrated to enhance the relationship between waterways and people." G8

"Water overflowing from the Chao Phraya River during high tide and flood seasons should be recognised as inherent part to the city's natural dynamics. If management grasps the history of waterways, solutions can be formulated without solely focusing on maintaining a perpetually dry environment." G1

"We need to emphasise to importance of history, which is urgent and must be considered. […] The heritage adaptation tactics, such as those used by residents in Talad Nongchok to take advantage of their settings, reflect the neighbourhood's subtle understanding of waterway dynamics in the face of changing water levels, whether during floods or drought conditions." G3

Values from both perspectives [II]/[IV] (Table 6-2), which overlapped and were expressed in the workshops (Table 6-4), underline the idea of BUW's natural and historical significance. This approach allows for tailored decision-making based on specific community contexts (Table 6-5). The ecological value, absent in [IV], was emphasised, and heritage significance in [II] was fulfilled through both day-to-day cultural and preservation value. Moreover, the workshops highlighted the apparent livelihood value held by participants, which was absent from both [II] and [IV] in individual tasks (Table 6-2).

6.3.2 Considering structural measures in BUW

The workshops explored the views that shared flood prevention values to frame the necessity of structural measures [I] articulated the role of free-flowing drainage capacity of BUW (BE-01/02/04), which was completely separated from the idea against structural measure, [II] articulated from the role of detention (FE-02/03/04/07). These two roles- drainage and detention- were integrated through group discussions to justify actual the extent to which structural measures should be accepted in the particular area, as exemplified by the three communities (Table 6-5). At the same time, the consideration of the nature of BUW as a detention role is of significance (G2/3/4/5/6/7).

"The urban hardscape is identified as a crucial element wherein structural measures remain essential, particularly in instances where green spaces or the BUW system aren't yet capable of operating optimally. Pumps, for instance, can facilitate water drainage in designated secure zones like hospitals." G3

"It becomes unfeasible to disregard the implementation of structural measures within the Sanseab Canal as long as the urban functions remain in this area [Minburi Area]. […] The watergate should play a supportive role in facilitating the flow system that can rely on and help the process of natural restoration. However, it is important to keep in mind that it must be a support system, not the main structure that we rely on" G5

"During the dry season, it will be essential to retain a certain water level in the Banglampoo Canal to ensure the functionality of boats. During the flood season,

allowing controlled water flow in the canal should be considered. […] The restoration efforts for the waterway's banks and water flow in the conservation area will need watergates to control water levels, especially in the initial phase of restoration." G6

The ecological value was expressed during workshops, suggesting that the waterway restoration must go hand in hand with ongoing improvement of the structural measures (G2/3/4/5/6/7). According to the Table 6-2, various values from [I] and [II] were missing. In the workshops, transportation and livelihood values were additionally expressed through the need for facilitated structural measures, such as controlling water levels, to support these functions (Table 6-4).

6.3.3 Justification of adaptive land use

Workshops discussed the notion of floodable land use [IV] with the potential of implementing in public use, which could facilitate urban function [V]. As Table 6-2 shows, neither of these views called on ecological or biodiversity value and livelihood value. In the workshops, participants expressed ecological value by considering the potential of these designed detention areas to contribute habitat creation (G3/4/5/8). The livelihood value was expressed through the use of technology in infrastructure to support essential services for people during the wet seasons. Each community demonstrated this collective sharing with local differences (see Table 6-5)

"Banpantom could enhance the area's overall health by allowing the Banglampoo Canal and other historical waterways to contain more water. However, this comes with conditions. The revitalisation of the area to provide space for water containment should not include residential living or permanent land use but should instead prioritise areas owned by the government, which are prevalent in the conservation zone, or public areas along the historical waterways." G8

"Where waterway banks are considered for adaptive land use, a case-by-case assessment is necessary. We agreed that 'public spaces' [along Sansab Canal], which encompass both public sector-owned locations by GA and private sector entities such as department stores, are suitable for the promotion of floodable areas. […] These areas, under GA control, will also be easier to create the habitats for plantation and more feasible to maintain." G5

"Innovation is being applied to heritage buildings to exhibit adaptive land use while concurrently incorporating urban functionality and technology to sustain daily operations. […] The traditional community settled along the Sanseab Canal here [Talad Nongchok] could demonstrate adaptive land use benefiting flood mitigation through heritage preservation. This requires the support of the GA to improve local infrastructure and renovate existing architecture, which may need to be redesigned to serve functions like sanitation." G4

6.3.4 Balanced benefit as a place of heritage

These two contrasting views – one involving prevention and the other permitting locals to occupy the areas – were discussed together as possible recommendations for BUW. This discussion centred on whether to allow the area to remain as private settlements (HC-01/03/04/06) or return it to public use (UP-01/02/BE-02/FE-06). Considering the value of livelihood, the workshops highlighted the shared expertise in balancing benefits within a place of heritage. Workshops considered the potential outcome of granting permission for locals, such as in Minburi Upatum, which could foster a sense of belonging and turn the area into a shared asset that locals could help maintain (G2/G5) (see Table 6-5). Workshops expressed day-to-day cultural value and preservation value when discussing the relationship between locals and the waterway, emphasising how restoration could enhance the area's identity and provide shared benefits (G1/2/5/8).

> *"There 'community forest' policy [in northern Thailand] grants community ownership of forests in proximity to their areas, encouraging locals to become stewards of these natural resources while also benefiting from them. …waterways could function similarly to forests in this regard. […] Despite the illegality of settling along the Sanseab Canal's banks, the historical significance of the architecture within these houses [in Talad Nongchok] calls for their preservation. The classification of land ownership in this area may need to differ from others. In this case, it remains vital to provide necessary public infrastructure facilities for these houses after permission is granted for them to continue settling." G2*

> *"If local communities perceive benefits from nearby waterways, particularly regarding their livelihood, they should potentially take ownership of these waterways. […] When a wide range of functions is incorporated, more people will use the Sanseab Canal frequently. This increased usage will lead to a stronger sense of ownership among the [Minburi Upatum] community. They will be more likely to develop an affection for it and take measures to protect and preserve it. […] This will result in the area being seen as a unique representation of each location." G5*

> *"In this way, the city as a whole becomes a collection of distinct and vibrant neighbourhoods, each with its own identity. […] There should be careful consideration of whether to maintain or halt further development in order to strike a balance in terms of the benefits derived from this place [Banpantom]. This implies that the economic value brought in by tourists should be considered only after the local community has achieved a level of sustainability independently." G8*

Shared expertise	Banpantom		Minburi Upatum		Talad Nongchok	
	Individual views:	**Workshop views**	**Individual views:**	**Workshop views**	**Individual views:**	**Workshop views**
Historical and natural significance	BC has a historical role for city and needs to be strongly protected. -or- BC should be considered the restoration for its natural condition.	Consider natural restoration of BC as the mean of historical significance although the areas have been protected.	SC' s historical significance should be considered, although it is not in a conservation zone. -or- SC should be restored the flow of water.	SC should be restored, which will benefit heritage considerations and strengthen the relationship between locals and SC.	SC should be considered heritage significance although it was not in a conservation zone. -or- SC should be restored the natural bank and waterflow.	Natural restoration and historical concern should be considered together as they are interconnected in SC.
Considering structural measures in BUW	Consider the restoration of tidal condition and water flow of BC -or- BC must be controlled to prevent the flooding through the low-level operation.	Consider a priority of natural restoration through the help from structure measure. Address the need for watergates integrated with BC's restoration and archaeological work.	Consider the restoration of water flow in SC -or- SC must be controlled.	Prioritise waterflow restoration with the aid of structural measures in an urban context. Address the need for watergates to serve transportation and erosion protection in SC.	Structure along SC must be effective. -or- SC should be restored with its ecological condition without any structures.	Consider a priority of natural condition through the help of structure measures. Address the need for watergates integrated with restoration to support food production.
Justification for adaptive land use	Historical BC width should be restored in order to store more water. -or- BC cannot be restored because area currently is active and functioning.	There is potential for implementing adaptative land use in public- owned spaces, excluding existing residential areas.	Apply land use adaptation with new building regulations for areas along SC. -or- Impossible to apply adaptive land use; the area should fully serve urban functions.	Consider flexible land uses for public spaces along SC, such as temples, schools, government buildings, public walkways.	SC should be flexible land uses due to its lower density function and potential of traditional houses. -or- SC should provide fully public access and return full rights to the GA.	SC should be considered the flexible land uses. Traditional houses should be provided with improved infrastructure and innovative design to support their functions during wet seasons.
Balance benefit in the place of heritage	BC should serve the conservation role for a city as a whole rather local benefits -or- BC should be restored the relationship with locals.	Consider the locals as part of the city development: granting permission for residents to be local vendors. This will also benefit the area's identity.	SC should be emphasised for the urban role, i.e., TOD. -or- SC should be recognised as the significant heritage, considering the locals identity.	Recognise the potential of locals owning the area, as this can foster a sense of belonging and encourage them to help maintain the area. This, in turn, benefits the city as a whole.	SC should serve as a drainage role to protect the inner city. -or- Locals should be prioritised due to their cultural significance.	If Bangkok aims to improve flood mitigation, the community will not be sacrificed. Locals utilising the canal consider the area's identity. This could benefit the identity of BUW, where they should not be all the same.

Note: BC = Banglampoo Canal, SC = Sanseab Canal

Table 6-5 Areas of expertise and values expressed in individual tasks and workshops through the community contexts

6.4 Consideration of prioritisation

This section outlines the reasons behind participants' choices and preferences as they engaged in workshop discussions, aiming to select or prioritise (priority) and deselect or deprioritise (non-priority) various interests. Throughout the participants' deliberations, four primary considerations emerged as pivotal in the decision-making process during workshop activities (see more in Appendix 3G/3H/3I).

6.4.1 Levels of change

Participants discussed the various levels of change that can occur in the BUW as a result of different management tasks outlined in the study material. This highlights how, even within the same level of change, participants adopt different approaches.

a. Minimal and irrelevant change (non-priority)

Participants described instances of a minimal degree of landscape change as maintaining the status quo or representing a "business as usual" situation, where these changes were considered unimportant or not a priority (BE-01/02/04, UP-01/04). They presented small changes that could be postponed and were not critical priorities, including Scenario [I] enhanced ongoing management and schemes like (5) improving garbage collection.

> *"I am not choosing Scenario-I because it will not change the landscape of BUW that much. It will just make the same things that have been done before. I do not see, for example, the maintained watergates or pumps will help any change, this is business as usual" UP-04: G6*

Schemes like (9) enabling access for routine consumption and (11) providing safety and security were discussed as irrelevant changes, similar to Scenario [III] prioritising benefits for locals (BE-01/02/04).

> *"I don't choose Scenario-III because that was the little change for the very small scale. […] It will influence nothing and no point in doing them [schemes 9 and 11] … the change needs to be more relevant than these." BE-01: G1*

b. Substantial change that is pertinent (priority)

Participants highlighted scenarios with a significant degree of change considered important, a priority, and substantial (FE-01/04/06/07, HC-01/03/05), including [II] natural restoration and [IV] floodable land use with heritage consideration. These were described as leading to substantial changes in land use regulations and being significant in both physical and regulatory terms. Similarity with schemes (4) improving wastewater treatment, (1) boundary control and relocating improvement (FE-01/02/04), and (13) consideration of heritage or area identity (HC-01/03/05), were seen as having a meaningful influence.

> *"I have a different opinion from BE-01 [who] said s/he cannot imagine how to make the significant change from Scenario II happen. I, however, think that if we can*

change, let's make a real change- the change of the whole system by recovering BUW [Scenario II]. So, it can be relevant enough to improve the BUW." FE 01: G1

c. Overwhelming change with resulting resistance (non-priority)

The same high level of change on scenarios [II] natural restoration and [IV] floodable land use with heritage consideration was discussed by participants as being non-priority because there would be resistance following such an excessive degree of change, especially in land boundary (BE-01/04, UP-04/05/06). Land prices and flood insurance were mentioned by participants as examples of prohibitive changes to residents and investors (UP-05/06). This also includes schemes (6) restoring waterflow and network, (7) restoring waterway bank, and (12) floodable land use.

"I am not choosing Scenario-II because this scheme requires too much change from the existing setting. The implementation of Scenario-II would change Bangkok as a whole to no longer be Bangkok as we recognise. Controversy would occur." BE 01: G1

6.4.2 Feasibility of implementation

Participants discussed the feasibility or likelihood of management tasks being implemented. They assessed the difficulty or ease of making these tasks a reality. Additionally, each of these degrees can be further categorised according to whether the task is considered a priority or otherwise.

a. Challenging but of great significance (priority)

Participants presented particular tasks that were considered a priority even when they were perceived as challenging and complex (FE-01/03/04/06, UP-01/03/05). Despite the difficulties associated with these tasks, they were assigned high priority, including scenarios [II] natural restoration and [IV] floodable land use with heritage consideration. Similarly, with all the challenges of schemes like (2) increasing detention areas, (12) floodable land use, which confronts land ownership and limited development opportunities, and (14) emphasis public water transportation with the challenge of management cooperation, participants remain committed to prioritising these tasks.

"I honestly know that Scheme (2) is not easy to implement or even to think about or understand. Proposing areas for waterway restoration [Scenario II] or increasing green space isn't easy. Mentioning them only in policy papers hasn't happened recently. I personally think that this (2) is an important starting point for waterway management. At least raising these issues in meetings or policy papers would be a good start." UP-01: G2

b. Extremely challenging and unlikely (non-priority)

Participants discussed management schemes with a high level of complexity and challenge, indicating they were not priorities, including (2) increasing detention areas, (4) improving wastewater treatment, (6) restoring waterflow and network, (7) restoring waterway bank (BE-02/03/04, UP-01/04/06), and (10) equilibrating the operation of watergates (UP-04/06). Participants described how changing wastewater structures would involve extensive underground work to improve pipes, and the process is inherently challenging (UP-01/06). Property owners are unlikely to permit the government to perform underground work on their properties. Each area has different needs, and the existing agency structure imposes significant complexity in improving watergate operation (UP-02/05). Inner areas also are unlikely to allow any level of inundation, even minimal (BE-02/04). Participants also applied this reasoning with scenarios [II] and [IV].

> *"I disagree with Scheme (2) because land prices in inner Bangkok are extremely high. Therefore, we don't implement this choice. I've never seen a government project that increases green space in urban areas for water management purposes. This is because it doesn't have as much value compared to other land uses. For instance, there was a project for green spaces along the river, but it wasn't possible to implement because the area is very densely populated." BE-02: G2*

c. Simplicity and more possibility (priority)

Participants prioritised management tasks based on their likelihood of implementation and simplicity, included scenarios [I] enhanced ongoing management and [III] prioritising benefits for locals and schemes like (3) improving structure capacity, (4) improving wastewater treatment, (5) improving garbage collection, (9) enabling access for routine consumption, (11) providing safety and security, and (16) involving investors and developers. Participants stated that, because there are already established agencies responsible for these tasks, this makes them more feasible to improve without the need for lengthy policy formulation or collaboration efforts (BE-04, UP-04/05/06). Participants described tasks which fall under the jurisdiction of the water management agency and should theoretically be carried out easily and directly because the agency has the autonomy to do so (BE-03,UP-03).

> *"…the separation of waste and rainwater management, garbage collection, and watergate operation can all be handled by the water management agencies themselves without requiring extended consideration or cooperation with others. They have the authority and scope of work to carry out these tasks directly if they want to. These can be accomplished in a shorter time compared to other options." BE-04: G5*

6.4.3 Outcome assessment

Participants prioritised management tasks based on their expected outcomes, considering two differentiations: long-term and short-term results. They also described the outcomes as the sequences of effects resulting from the actions, including knock-on effects and sequenced impacts.

a. Long-term outcome of considerable importance (priority)

Management tasks expected to yield long-term results were considered a priority by participants. These included schemes (6) restoring waterflow and network, (8) granting permission to inhabit and earn a livelihood, (12) floodable land use, and (13) considering heritage and area identity. Participants discussed that granting rights to locals could encorage them to take care of the area as a sense of belonging develops (UP-04/05), and cultural considerations could reinforce the relationship between the waterways and locals, thereby shaping the area's identity (HC-04). Similarly, scenarios [II] and [IV] were prioritised because they produce long-term benefits by reducing the risk of flooding and making settlements in flood-prone areas more adaptable and better equipped to withstand adverse conditions (FE-01/03/04/06, HC-01, UP-04/05).

> *"…if we stick to the Scenario-I for the structure system operation […] the risk remains very high. […] Therefore, Scenario-I does not fit as well as Scenario-II. I think scenarios II and IV should be considered by the GA, as they represent the most comprehensive solutions to the existing conditions and future changes, based on the reality of the situation and natural conditions." UP-04: G6*

b. Short-term and inconsequential (non-priority)

Participants discussed that management efforts resulting in short-term outcomes would not be prioritised, including Scenario [I] enhanced ongoing management and schemes like (16) involving investors and developers, (3) improving structural capacity, and (10) equilibrating watergate operations. Participants suggested that even if structural measures are enhanced to increase capacity, their effectiveness would only yield short-term outcomes. The short-term design capacity of the existing structural measures typically remains effective for only two years (BE-04). Participants also highlighted that watergate operations in the BUW are prone to human error. Despite efforts to improve them, errors persist due to the contentious nature of the area (FE-01/03, UP-03, HC-01).

> *"…The last two choices [schemes 3 and 10] are considered hopeless. I did not prioritise them because improving the structure doesn't help much. The engineering approach focuses only on location-by-location improvements, without considering the entrie system…and the outcome will be very short term." HC-01: G1*

c. Significant knock-on effect (priority)

Participants highlighted the prioritisation of management schemes that primarily increase the occurrence of other consequential results. This included schemes (1) boundary control and relocation improvement and (8) granting permission to inhabit and earn a livelihood, as there are important for identifying land ownership (UP-0/04). Additionally, schemes (4) improving wastewater treatment will result better water quality in the waterways, and (14) emphasis public water transportation will foster an intimate relationship with people who routinely use the route (UP-02/03/06, HC-01/05/06). Scheme (16) involving investor and developer was seen as a potential "quick-win," which can at least initiate a conversation among stakeholders (HC-04/FE-06).

> *"…Give the explicit rights and define the land ownership is very important [schemes 1 and 8]. The issue I used to face was with the landowners or the owner of areas along the waterways, including unclear rights and boundaries. I see this issue as a main factor creating other problems afterwards and obstructing new or developed projects." UP-02: G3*

d. Sequential outcome and of little significance (non-priority)

Participants described management tasks that were not considered priorities because these tasks are more likely to occur spontaneously or more easily when other tasks have already been implemented. This included schemes (9) enabling access for routine consumption, (11) providing safety and security, (14) emphasis public water transportation, and (15) providing recreational public access. All of these could occur after improvements in water quality. As long as the waterways remain unclean or have not regained their value, these tasks would not be prioritised (HC-01/06, FE-03/06). Participants described how scenarios [III] prioritising benefits for locals and [V] highlight urban functionality were considered low urgency and could potentially be implemented after the waterways have been improved.

> *"That's why I put these cards [schemes 9,11,14,15] here– these can easily be achieved after the natural system has healed. There is no need to prioritise them" HC-01: G1*

6.4.4 Perceived Benefits

a. Benefits favouring specific groups (non-priority)

Participants discussed that when the benefits of a management choice primarily favour one specific group of people, it was considered insignificant. This included schemes like (16) involving investors and developers and (3) improving structural capacity, which would benefit construction budgets rather than focusing on improving the overall system (BE-02/03, UP-05/06). Participants also described Scenario [I] enhanced ongoing management as perpetuating a budget spending cycle that benefits specific groups of people (FE-02/03, UP-02/04). Scenario [III] prioritising benefits for locals was described as overly favouring locals, who are not the only group of people using the BUW space (BE-01/06).

"Normally, investors seek value for money, one way or another […] It is difficult to convince them [the investor] to fully commit to CSR. There is a question of whether they will be honest in helping manage the area. When we decide to include investors, we need to address this concern from the start. I think it is not appropriate to involve them in gaining or controlling benefits related to the area along waterways." BE-03: G4

b. Primarily profiting locals (priority)

Participants addressed that priority should be given to tasks that have a direct influence on people's lives; specifically, residents who live along the BUW should be prioritised (HC-03/04/05, UP-02,03,04). This includes schemes (8) granting permission to inhabit and earn a livelihood, (9) enabling access for routine consumption, and (11) providing safety and security. Schemes like (4) improving wastewater treatment and (5) improving garbage collection were also considered a priority in terms of providing essential services to community areas (BE-04, UP-03).

"The choices that mostly connect to residents (schemes 8,9,11) should be improved firstly. This is because the existing problems are very clear. These are the scales that connect more directly to people's lives than other choices." UP-03: G4

"I prioritise the cleanliness (schemes 4 and 5) as I chose these two cards following the standard infrastructure that management should provide to residents." BE-04: G5

c. Benefits serving the public with great importance (priority)

Participants suggested that priority should be given to actions that offer shared benefits and support the city as a whole, rather than placing excessive emphasis on local concerns. This included schemes (14) emphasis public water transportation and (15) providing recreational public access (HC-06). Scheme (1) boundary control and relocation improvement was addressed by participants as a proposal to return these areas to public ownership (FE-01/04/05, BE-01/03/04, UP-02/04/06). Scenarios [I] enhanced ongoing management and [V] highlight urban functionality would better suit the conditions of Bangkok as an urban city (BE-01/02, UP-04).

"Therefore, the [Banpantom] community sometimes has to make sacrifices to achieve shared benefits for the whole city. These schemes (14,15) should be prioritised as they benefit the overall city rather than focusing on the local scale." HC-06: G8

"I prioritise Scenario-1 to enhance flood prevention […] Other scheme likes (8), the benefits accrue too much to individuals. We have to assess whether landowners should donate their land to the public or if expropriation is necessary. […] We have to discuss with the residents and consider the shared benefit that are important for public goods, rather than just their [locals] advantages." BE-02: G2

6.5 Challenges in knowledge sharing between stakeholders

During group discussions, different interests arose within all eight workshops, addressing the challenges of sharing knowledge, particularly between the waterbody experts and place-making experts, who were interested in different viewpoints (Appendix 3G).

> *"I consider improving the waterbody first. I look at the area along the waterways later—this is less important compared to the water issue." FE-02 G3*
> *"...So different from me. I prioritise area management related to the people living along BUW in the first stage." UP-02 G3*

The various prioritisations (Section 6.4) reflect the roles of participants in BUW management. For example, there was a divergence in opinions on where to focus wastewater treatment improvements. The urban planners emphasised better planning and preparation of the under-developed areas, while the built-environment engineers favoured enhancing the existing infrastructure.

> *"I have a different point of view. When BE-02 mentioned improving wastewater treatment only in dense urban areas rather than in less populated areas, I disagree. […] Why should they wait until the areas get denser before providing infrastructure [wastewater treatment]? You should prepare for city expansion." UP-01 G2*

The positionality of participants influenced the challenge of open discussion during the activities. As described in Section 3.9, the dynamics of age, for instance, show that mature, assertive individuals often initiate conversations, while younger participants, even if they have different viewpoints, tend to follow the seniors' opinions.

> *"I agree with BE-04's priority [Scenario I ongoing management] ...when we consider the real process of coordinating the work, we usually prioritise like him/her [BE-04] - choices that can be done directly are put in the plan immediately... My priority [Scenario II natural restoration] is quite impossible." UP-03*

This chapter provides comprehensive findings in terms of decision-making, showing the transformation of the valued landscape, the limitations in individual focus, and the role of values in collaborative decision-making (Section 6.2). It describes the expression and integration of values in decision-making processes (Section 6.3). Different prioritisations and the reasons underpinning alternatives (Section 6.4), including the challenges in open discussion for collective sharing (Section 6.5), are presented. These findings will be discussed in relation to existing knowledge and literature in the next chapter.

Chapter 7 Discussion

7.1 Introduction

This chapter starts with an exploration of the physical transformations within Bangkok's urban waterways (BUW) (Section 7.2). Section 7.3 delves into the influence of governance on changing BUW by scrutinising the depth of agency performance and participation processes in BUW management. The chapter then addresses the positionality of landscape knowledge (Section 7.4), revealing the lack of understanding and acknowledgement within Bangkok governance. In Section 7.5, the potential of community-driven initiatives for effective management of BUW is discussed. Section 7.6 continues to delve into the discussion of the evolving values, which include original values in history and modified values or the undergone transformation version to align with the new urban setting. Section 7.7 continues the discourse on decision-making, navigating the dilemma of public goods of urban cities and community benefits in BUW management. The chapter concludes with Section 7.8, which provides an example of an institutional collaboration in occupying the landscape approach of the BUW context.

7.2 Revealing the unintended change of BUW and their complexity

The research findings demonstrate the process of change (RQ 1.1), providing practical empirical evidence of the barriers to implementation. Findings also highlight the role of governance in facilitating these BUW's changes (RQ 1.2).

The findings from Section 5.2 demonstrate the altered state of BUW in densely populated urban areas, evidenced in Banpantom and Minburi Upatum. These areas now lack natural conditions and exhibit poor water quality, a direct outcome of management decisions that have exercised control over, and at times eliminated, BUW. For instance, the construction of structures along the waterways' edges (Section 5.2.1) has supplanted natural banks, and the blockage of watergates have caused poor water quality (Section 5.2.4, 5.2.5). These actions favouring rigid edges and controlled waterways have persisted since the city began developing in the 1940s (Section 4.6.1, 4.6.2). The declined conditions of natural landscape in urban dense settings are found in other Asian big cities likes Ho Chi Min (Lempert et al., 2013) and Jakarta (Worldbank, 2011, Colven, 2023).

Control and the disappearance of waterways (Section 5.2.4) was demonstrated in Minburi Upatum, indicating how the flow of a remaining minor waterway has been obstructed by an embankment, resulting in poor water quality. In Talad Nongchok, embankment structures hinder water flow through irrigation channels to farmlands. Disappearance is particularly evidenced through minor waterways, as many of them have been covered to create space for development or improve accessibility across the three communities. Ironically, these waterways used to be the main means of access since the early settlement (Section 4.5.1) and the water city period (Section 4.5.2). The resulting frequency of urban flood in Bangkok is unsurprising when there is no way of water to go (Marks, 2016, Davivongs et al.,2012), and the existing flooding prevention does not reach their capacity (Section 5.3.9). This displays a complex (and common) change in the hydrology regime in urban settings (Innes and Booher, 1999).

Land ownership and boundary change (Section 5.2.3) are particularly evident in the Talad Nongchok controversy. In this case, the government agency (GA)'s efforts to define water bodies and land through embankments (Section 5.2.1) oversimplify the intricate dynamics of complexity changes. This is evidenced when the DSD recognised an illegal encroachment of Talad Nongchok, while residents (RE) insisted on their legal rights.

The idea of Talad Nongchok being improvised or unplanned settlements can be explained in the literature, which indicates the absence of government support for essential infrastructure when land rights are unclear (Martine, 2011). A parallel incident unfolded in Minburi Upatum where the community has always been excluded from any policy implementation regarding their land ownership (Section 5.2.3/ 5.3.6). Findings echo the influences of land ownership on the change of canals and the tensions among stakeholders in western Bangkok (Davivongs et al.,2012). This reflects the literature on challenges in plan implementation when various stakeholders are involved (Talen, 1996, Phi et al., 2015).

The findings indicate that waterways in Bangkok have historically been settled by communities, as analysed through historical settlement patterns (Section 4.5.1). Therefore, not all of areas along urban waterways in Bangkok necessarily represent areas of 'ecological vulnerability' as discussed in literature regarding migrations encroaching on watershed areas (Martine, 2011). This is particularly true where traditional communities have been settled, as represented by the water communities (Section 4.7, 4.8, 4.9). This is especially evident when considering the BUW's values held by locals (Section 5.5), such as the benefits associated with natural inundation (Section 5.5.11). This thesis argues that encroachment (migration) and traditional settlements of BUW cannot be rigidly separated. Firstly, due to their complex social structures, including both old generations and newcomers who have different needs (Section 7.5). The complication is also reflected in the intricate patterns of landownership and boundary changes over time, exemplified by the unclear land rights in Talad Nongchok and Minburi Upatum (Section 5.2.3).

The diminished accessibility of BUW (Section 5.2.6) exhibits the influence of proposed projects (Section 5.6), overlooking the reliance of communities like Talad Nongchok for their daily water needs. A parallel incident unfolded in Minburi Upatum with the construction of a walkway and embankment, echoing the challenges observed in the change of Sanseab Canal, such as re-orientated settlement and diminished accessibility to waterbody (Section 5.2.2). The walkway's inefficiency became evident in its temporary function on public routes. Despite GA claims of repurposing, i.e., improving the area for public service, the structures along BUW actually impede permanent accessibility to the waterways. Instances such as the Sabarmati Riverfront demonstrate a similar phenomenon, where the construction of riverfront structures can hinder visibility and physical connection to the river (Dempsey et al., 2020, Dempsey et al., 2017).

Flood management initiatives, led by the DSD in Talad Nongchok, demonstrate a lack of comprehensive understanding of local culture and conditions (Section 5.6). The resulting structures not only limit locals' access and visibility to Sanseab Canal (Section 5.2.6) but also reveal shortcomings in capacity and effectiveness, highlighted by the breakdown of the flood dike in 2019 (Section 5.3.5). While the GA attributes the damage to drought, residents argue it stems from bribery (Section 5.3.3) and limited local's information being utilise in decision-making (Section 5.3.7), leading to substandard construction. A similar phenomenon of local exclusion was seen in the decline traditional water village in Brunei (Azman et al., 2021).

Flooding has been caused by the decision to close certain watergates as evidenced in Minburi Upatum (Section 5.2.7). Findings show that BUW is intertwined with environmental issues, such as significant floods, and also encompass social exclusion when locals are not included in the decision-making process (Section 5.3.5). This aligns with previous studies on flooding events caused by elevated roadways and sandbag wall outside protected zone (Marks, 2020, Marks et al., 2020).

Changes in BUW across three communities reflect the neglected BUW in the city scale (Section 4.6.2). This significant transformation of the landscape due to human influence (Misiune and Depellegrin, 2022) departs from the concept of harmonious coexistence between humans and nature (Zube, 1987), observed not only in Bangkok but also in other Asian Cities, mentioned earlier, such as Ho Chi Mihn, Jakarta, and Brunei. This loss of landscape desirability is evidenced in this thesis through the values being absent and diminishing (Section 6.2.1), which are intertwined with the physical transformation of waterways (Section 5.2).

Landscape value that is absent and evolving in waterway management (Section 6.2.1) contributes to the complex change of BUW. For instance, the lack of consideration for transportation value in waterways during city development from 1915 onwards (Section 4.6.2) led to the construction of a bridge with inadequate clearance for boats (Section 5.5.3). By 1990, when boat transportation resumed to serve urban needs, the low water level required for boats to pass through necessitated the construction of water gates. Unfortunately, keeping the gates closed at low water levels has resulted in poor water quality (Section 5.2.4), creating a cycle that demands unnecessary management and hinders seamless water transportation over Bangkok (Section 4.2). This reflects that even minor alterations introduced into the system can lead to unexpected consequences of fragmentation (Martine, 2011, Forman, 2008).

The landscape value can be interpreted differently by actors, which then leads to conflict. There has been a dominance of investment in infrastructure, such as building streets and new houses, to enhance city development (Section 4.6.2), which typically benefits developers and political tycoons due to their political power and economic favourability, with nothing to do with the geographical consideration of the urban landscape (Marks, 2016). This later influences the act of filling canals (Davivongs et al.,2012), as evidenced by controlled waterways and their disappearance across three communities (Section 5.2.4) and other BUW (Section 4.6.2). The shift is due to BUW transitioning from being accessible to now being inaccessible, as acknowledged by GA and developers (Section 5.2.6). Findings further indicate contrasting values on the desirable settlement of BUW (Section 5.5.6). While locals in three communities hold them in high regard, GA and developers often take an opposing stance. The differentiation in BUW's values is further discussed in Sections 7.5 and 7.6.

7.3 Understanding influencing change from governance and the need for its reform

This discussion explores how governance influences changes in BUW by illustrating their operational structure, highlighting hindrances, maintaining the status quo, and obstructing management (RQ1.1) before providing potential explanations in overcoming these barriers (RQ3.3).

7.3.1 Strong influence of agencies

The management of BUW elements in urban areas falls within the realm of both water management and place-based considerations. Issues surrounding fragmented communication, distinct agency interests, and limited knowledge (Section 5.3.1/5.3.7/5.3.8) persist in BUW management processes. Consider a scenario where a flooding issue arises in the Old Town Area, and the DSD is tasked with addressing it, while the FAD and RC-ONEP oversee this conservation area. Despite these government agencies have projects to improve the situation – one focused on drainage enhancement and the other on area preservation – the projects proceed independently. Fragmented and essentially meaningless communication, as evidenced in Section 5.3.2, occurred only after solutions and objectives were fixed by DSD without any community involvement (Section 5.3.5) (Fig 7-1 Left).

These findings reflect the Jigsaw Metaphor (Collins and Ison, 2009) when each agency views BUW differently and pursues different objectives, treating BUW as fixed problems. This echoes the management structure related to BUW, where multiple agencies are involved in various aspects (Section 4.2), reflecting a traditional government structure (Reed, 2008). This absence of a mechanism for collaboration between authorities (e.g. DSD and FAD) to jointly run projects and request budget allocation as shared tasks is highlighted (Fig 7-1 Left, Section 5.3.2/ 5.3.8). If agencies currently request discussions or collaboration on topics that lack specificity, other agencies are unlikely to express interest in participating (GA-07). This creates a problematic loop that hinders the possibility of agencies engaging in integrated efforts and discussions, as evidenced by informative communication (Section 5.3.2). The organisational structure has been identified as a major logic of inaction (Dobson and Dempsey, 2021) – here, in effectively managing BUW.

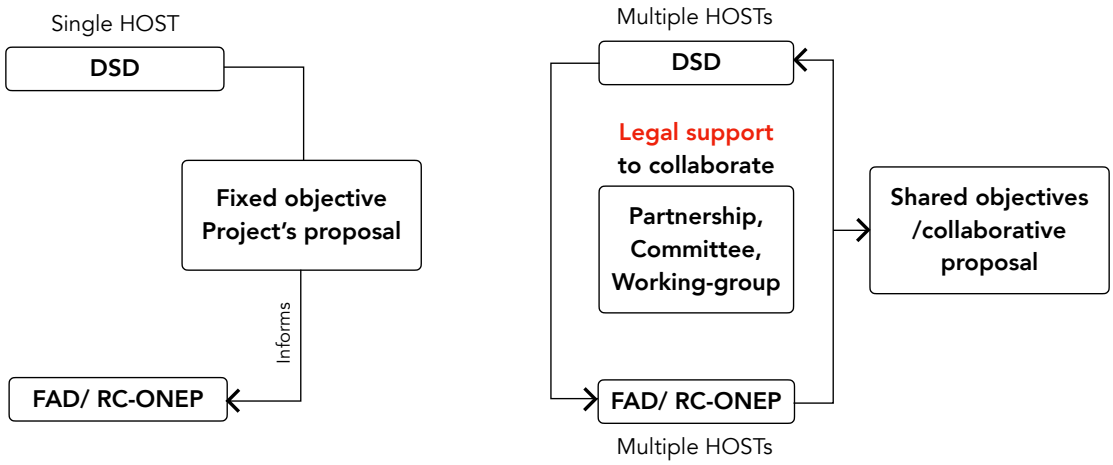


Fig 7-1 Existing communication process (Left), Potential collaboration emerging from the findings (Right)

The involvement of multiple agencies within the conservation zone reveals the presence of numerous institutions (Section 4.3); however there is fragmentation (Section 5.3.1), as also seen in literatures elsewhere (Tantinipankul, 2012, Prakitnonthakan, 2012, Issarathumnoon, 2006). In the Banglampoo Area, this includes the FAD, RC-ONEP, DSD, and TPD. Regarding transportation, this involves a different combination: RID, DSD and MAD illustrating wide

institutional involvement (Section 4.2), which can lead to delays in the process in practice (Section 5.3.9).

For example, the drainage capacity improvement project in Rattanakosin, initiated by the DSD, encountered challenges in terms of waiting time and communication with FAD and RC-ONEP regarding DSD's proposal to renovate the piping diameter (Section 5.3.8/ 5.3.9). Eventually, DSD explored alternative solutions, such as raising flood dykes and installing additional pumps to enhance drainage capacity, as seen in controlled BUW (Section 5.2.4). This is reflected in the installation of heightened floodwalls along the Chao Phraya River after major floods (Section 4.4), illustrating the predominant use of structural measures (Saito, 2014; Laeni et al., 2019). The ineffective communication and multiple agency involvement highlighted in the findings (Section 5.3.2), can be found elsewhere in the literature (Sevilla, 2012), including in Venice and its Lagoons (Munaretto et al., 2012).

This points to the need for enhancing meaningful communication and collaboration among different agencies as an urgent task in Thailand (Saito, 2014, Jular, 2017, Nair et al., 2014). When numerous agencies are involved, the findings from the workshops (Section 6.3) highlight that it becomes crucial for them to engage in critical communication and cooperation (Punyaratabandhu, 1985) and potentially use the notion of chairs-around-the-table (Forman, 1995). The primary goal of collaboration among agencies is to integrate various tasks related to the BUW. For these alternatives to be relevant, it is crucial for agencies to pursue the common ground (Lecuyera et al., 2018), shared value, and agreement on what changes should be acceptable (Plieninger and Bieling, 2012) (Fig 7-1- Right/7-2-Right).

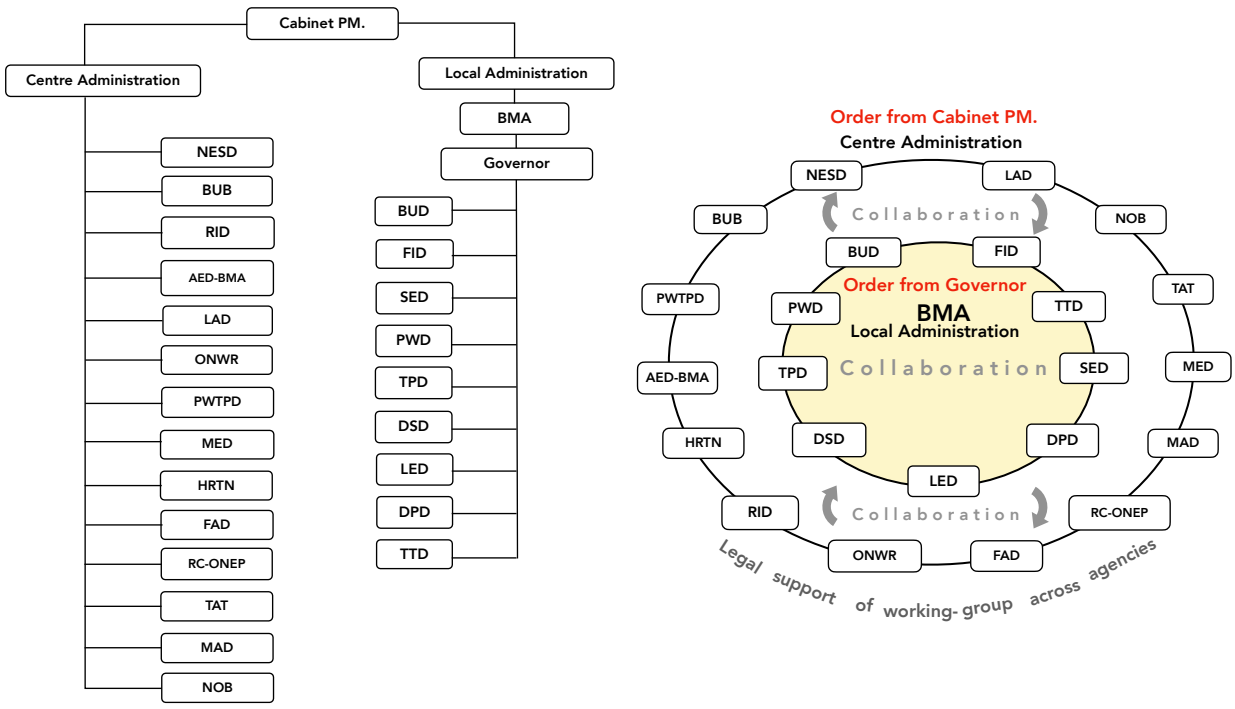


Fig 7-2 Current working structure of the government agencies relating BUW (Left) Potential collaborating work, emerging from the findings (Right)

The necessity to reevaluate regulations, particularly the term 'host' or an agency, which typically only permits a single agency to assume this role, should be considered. Considering Figure 7-2-Left, each agency has distinct and independent roles and responsibilities (Section 4.2) representing traditional government structures found around the world (Reed, 2008). This current approach (Fig 7-1-Left/7-2-Left) is identified in the findings as potentially hindering critical conversations. The process for establishing a 'working group' and 'partnership' should be announced, as indicated in the literature (Slater et al., 2007), without the need for an investigation by, in the case of BUW, the State Audit Office of the Kingdom of Thailand (SAO), eliminating unnecessary bureaucratic hurdles.

"Indeed, it's important to consider regulatory and legal support for the establishment of such working groups who must be the actual working staff not the senior committee. This could take the form of an order from the central government authorizing the creation of these groups or enshrining in the law that forming such working groups is not only acceptable but also encouraged. […] The goal is to empower participants to engage actively and communicate effectively when they return to their respective agencies. In this way, individuals from different agencies can become more convinced and contribute meaningfully to the collaborative efforts." (G-8/workshop)

The importance of effective leadership within the BUW management system is also highlighted: capable leaders are considered to offer solutions to overcome various obstacles. Findings introduce the concept of 'charismatic leadership,' referring to individuals with a strong vision who are highly effective in their roles. Their power can expedite processes, enable efficient decision-making, and prioritise objectives, potentially leading to shorter timeframes and streamlined operations. This is also echoed elsewhere (Sweeting, 2002, John and Cole, 1999).

In Thailand, the national leader or Prime Minister wields significant influence, capable of facilitating collaborations that might seem impossible and having the power to appoint a shared host for such collaborations. However, this typically happens only when the national leader recognises the importance of the issue at hand. Findings suggest that such facilitation could occur more regularly. A study in London shows examples illustrating how central government can act as a positive force in promoting collaboration, with many public service policies now based on partnership working (Slater et al., 2007).

The city leader, embodied by the Bangkok Governor, emerges in the findings as a critically important figure. Although the Governor's powers are somewhat limited compared to the influence of the national system (Sevilla, 2012, Punyaratabandhu, 1985), they still wield considerable influence. They can facilitate the seamless communication among departments under the BMA, as demonstrated by their accountability role in Section 4.2. They should emphasise collaborative, rather than informative, communication (Section 5.3.2). This is also found in literature concerning urban leadership, exemplified in the Mayor of London as a 'visionary leader'. There is a balance of both strong and weak characteristics in decision-making of Mayor in London. While the Mayor wields considerable influence within the Greater London Authority, their authority outside of it is limited by conflict of national interest (Sweeting, 2002). This aligns with the situation of Governor of Bangkok (Punyaratabandhu, 1985).

Leaders within each department or agency also play a pivotal role in facilitating (or hindering) collaborative tasks. They can effectively request assistance from different departments, even before projects are fully defined regarding objectives and solutions (GA-08). This ability is particularly pronounced when there is an established familiarity among these leaders, aligning with the norm of "connection" in Thai culture (Jiraprasertkun, 2015) (UP-04/05). Consequently, the proactive actions taken by these leaders have the potential to enhance the integration of tasks and to streamline operations in Bangkok.

7.3.2 Participation process

The findings also shed light on the strained relationship between agencies and residents through their engagement processes (Section 5.3.5), which tends to be characterised as detrimental and fragmented. Agencies frequently perceive residents as potential obstacles to project implementation and, accordingly, tend to exclude them from decision-making processes.

Although there are policy documents addressing the process of resident engagement, such as in the conservation policies (Section 4.3) and the rhetoric gesture from government agencies describes their strong relationship with residents (Section 5.3.5), the limitations in the process persists in BUW. This can be explained by Arnstein's ladder of participation (Arnstein, 1969). The "informing" rungs are at play in Minburi Upatum and Banpantom when residents perceive the information as one-way (Section 5.3.5). The "placation" rung describes how residents have limited influence on decision-making, which is shown through the Rattanakosin Plans (Section 4.3) and Bangkok Comprehensive Plans (Section 4.6.2). There is no evidence in Talad Nongchok that residents are involved in the processes of the Sanseab Canal's embankment construction (Section 5.3.5). This lack of local involvement in BUW reflects the culture of class limitation and inequality in Thailand (Marks et al., 2020), and also echoes extensively in literature on Thailand's flood management (such as Phanthuwongpakdee, 2016) and heritage management (such as Aruninta, 2009). This neglect of local involvement is encountered elsewhere, such as in Tongli in China (Porfyriou, 2019).

The waterways are considered public property despite being intertwined with private landownership along BUW (Section 4.7/4.8/4.9, Section 5.2.3) – an unclear land ownership situation very common in cities (Martine, 2011, Laquian, 2011). Disagreements can arise when residents are not informed about upcoming projects. This lack of awareness often stems from agencies constructing structures within their own jurisdiction without adequately involving the local community. As a result, conflicts emerge over issues related to ownership and the use of these shared resources (Martine, 2011). This is demonstrated in BUW acutely through the example of Talad Nongchok residents complaining about the excessive height of the embankment when GA persists in maintaining construction to "protect Bangkok as a whole" (Section 5.2.6/ 5.3.5), following the flood management's objectives (Section 4.4).

Moreover, the research reveals an ineffective system in which the process for residents to make appeals to the GA is notably protracted, as shown in Talad Nongchok (Section 5.3.5). The importance of "connections" in Thai culture becomes evident, again, in the process of residents appealing to the GA. Having a connection or knowing someone within the GA is crucial for any progress. Unfortunately, in most cases, local residents lack such connections or anyone who can

advocate for their requests. In this regard, third parties or facilitators can play a crucial role in expediting communication with the GA.

The first recommendation, therefore, is to respond to the need for a third party's involvement as a facilitator (Laquian, 2011) based on their reliability in communicating with the GA and empowering the RE. They could serve as an intermediary, acting as a safeguard to prevent the GA from exerting excessive control over the residents. The findings show that the GA often wield their power to issue orders to RE, both directly and indirectly, such as by withholding information or not providing accurate information, as evidenced in Talad Nongchok (Section 5.3.5/5.3.7). When RE engage with the GA, they are often met with scepticism and sometimes condescension. However, when a third party becomes involved, they might assume a role that is seen as more trustworthy and respected by the GA.

The third party's involvement, here differs from the conventional pattern of hiring consultant companies after the project's objectives have already been firmly established (Fig 7-3 Left). This recommendation underscores the significance of establishing 'partnerships' that can serve as intermediaries when multiple existing agencies and stakeholders are engaged in the same area. These recommendations are especially vital in facilitating communication with local communities (Fig 7-3 Right).

Arnstein's higher rungs of citizen power, encompassing partnership, delegated power, and citizen control (Arnstein, 1969), may not seamlessly align with recommendations in the Thai context. To illustrate, findings from Section 5.3.5 highlight residents' requests for flood prevention. It becomes apparent that local decision-making is influenced by incomplete or undisclosed data/knowledge (FE-02), highlighting the need to prioritise transparent data dissemination. GA should respond by providing RE with comprehensive and unbiased information rather than selectively sharing data (FE-05). Access to available data is an issue in the Thai's context because citizens currently cannot access information about where they live, such as elevation data, flood risk data, etc. (Section 5.3.5/5.3.7).

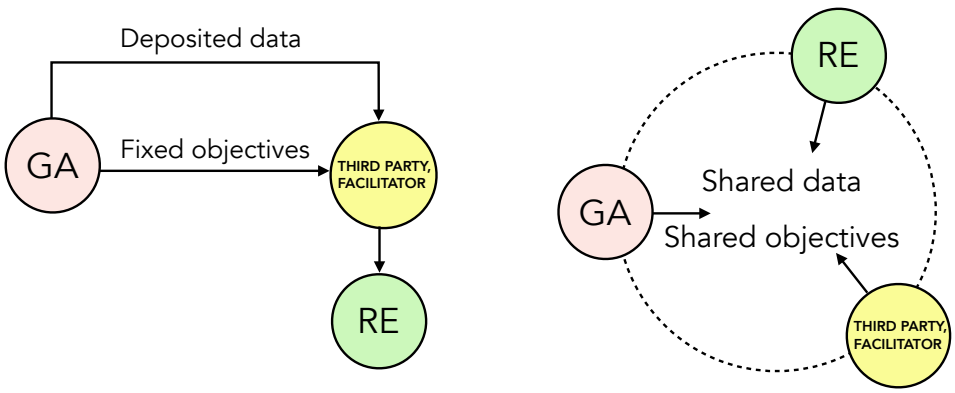


Fig 7-3 Existing fixed objectives/hidden data/resident involvement through facilitator (Left), Potential shared objectives/data, and meaningful resident involvement (Right)

In the Thai context, enhancing knowledge among residents should be an important aspect to address. When local residents have access to information and knowledge, they become better

informed and gain the capacity to engage in negotiations more effectively. This is supported by Collin and Ison (2009), who emphasize social learning, suggesting that people should collaborate to better understand and address intricate and challenging environmental problems. Once this knowledge is disseminated, community independence could be achieve, including through financial autonomy (FE-06). This autonomy could empower local residents to manage their budgets, fostering independent decision-making and reducing dependence on directives from the GA.

Therefore, public participation, which is already meant to be a standard procedure in Thailand, could be considered to occur (such as Laeni et al., 2019, Ratanawaraha, 2016a) more critically and meaningfully. A more critical approach is required, including creating opportunities for residents to engage in discussions (Reed, 2008, Reed et al., 2016, Arnstein, 1969) pursuing shared objectives, and being actively informed of transparent data (Fig 7-3 Right).

7.4 Revealing the position of landscape knowledge in managing BUW

This discussion revolves around explaining the positions of landscape knowledge within the decision-making process regarding BUW (RQ 3.1), before delving into understanding the holistic approach of this knowledge in addressing the complexity of the BUW (RQ 3.3).

In terms of the desirable change from stakeholders (Section 5.4), findings indicate that RE focused on meeting their basic needs (Section 5.4.3), while GA prioritised the provision of public services (Section 5.4.1/5.4.5). This echoes the trajectory of management actions regarding BUW during city development (Section 4.6.2). The GA and RE concentrated on such approaches directed towards ongoing management, urban functionality, and priorities such as granting permission to earn a livelihood. A similar trend persists in the Southeast Asian developing nations, particularly evident in major cities like Ho Chi Minh (Lempert et al., 2013), where the focus remains primarily on city development with efforts directed towards basic needs and public services without giving much thought to a holistic approach and environmental concern.

The findings elucidate how ongoing management structures concerning BUW hinder knowledge integration (Section 5.3.8) because they lack shared goals (Laquian, 2011), as discussed in the concept of collaboration in Section 7.3.1. Holistic BUW management faces obstacles because no agency is singularly responsible for addressing the overlapping tasks, meaning that BUW as a landscape element cannot effectively be managed within a traditional government structure (Section 4.2), such as environmental and other other landscape management (Martine, 2011, Innes and Booher, 2003).

The findings indicate that GA tends to overlook and ignore holistic approaches because their current working structure does not provide them with the opportunity to consider such collaboration (Section 5.3.1/5.3.2/5.3.8). Bangkok lacks effective regional plans (Sevilla, 2012, Marks, 2016), which are essential for working within natural landscape elements like waterways (UP-05). Research findings indicate that individual agencies' implementation efforts operate independently without contributing to the overall system of waterways as landscape (Section 5.3.8).

The DSD, for instance, focuses on drainage capacity and does not directly address the waterways themselves. Even in cases like Talad Nongchok, where the RID is involved, the waterways are primarily viewed as irrigation channels rather than integral landscape elements (Section 4.2/5.6). Given the distinct characteristics of the three study sites, the findings reveal that the DSD tend to apply their existing conventional knowledge of drainage channels to shape every implementation in waterways, focusing on short-time outcomes that they prioritise (Section 6.4.3). This echoes throughout their implementation of BUW over time (Section 4.4).

Neither the FAD nor RC-ONEP actively responds to BUW in conservation areas; instead, they treat historical waterways as objects. Tasks implemented in these areas tend to adopt an object-centric approach focused on conservation (Taylor, 2018), rather than a holistic landscape approach (Reed, 2008, Görg, 2007). While the Banglampoo Canal is adorned with heritage materials through conservation management, as discussed in Section 4.3, the waterways themselves, as landscape elements with natural systems and intrinsic relationships to local communities, are not considered (Section 5.6).

The Comprehensive Plans by TPD demonstrates a parallel occurrence where the land-use code predominantly focuses on economic development with limited attention to the water management (Section 4.6.2), echoing findings elsewhere (Ratanawaraha, 2016b). GA lack recognition of the BUW's values except when it can influence to economic benefits such as attracting tourists through preservation value along the Banglampoo Canal (Section 5.6). This includes other commercial projects along BUW, like hotels and department stores, fostered by developers and supported by the Comprehensive Plans (Section 4.6).

Although the ONWR addressed the ecological value in their policy (Section 5.6), their action plan translated their vision of waterway reclamation into a focus on cleanliness through constructed treatment structure (Section 4.4/ 4.8), as evidenced in Sanseab Canal. Unfortunately, their action plan has excluded the Minburi Upatum Community from the proposed treatment system (Section 5.2.5). This results in limitations in creating an inclusive system and reflects the ongoing ineffectiveness of Bangkok's current wastewater treatment (Section 4.2).

There is no single agency responsible for 'landscape' or considering BUW as a landscape element. This is because each GA focuses on their individual tasks, which are seen as simpler and more possible (Section 6.4.2 c.), while landscape initiatives are considered as time-consuming, extremely challenging, and unlikely to be called on (Section 6.4.2 b.). The application of landscape knowledge is completely absent in BUW management.

In this discussion, it is crucial to highlight that this thesis does not intend to, nor cannot, definitively conclude whether BUW's management approach should lean towards a more appropriate structured embankment (than the ongoing one) along the waterway or follow the natural bank of the waterway (as per the five scenarios in Section 5.4). As discussed in Section 3.5.3 Chapter 3, the scenarios presented do not determine which option should be favoured. Rather, the research underscores how the proposed approaches must view waterways as integral landscape elements, Figure 7-4 right, rather than adhering strictly to predefined objectives in current management practices. This rigid boundary (Fig 7-4-Left) is an example of logics of inaction (Dobson and Dempsey, 2021).

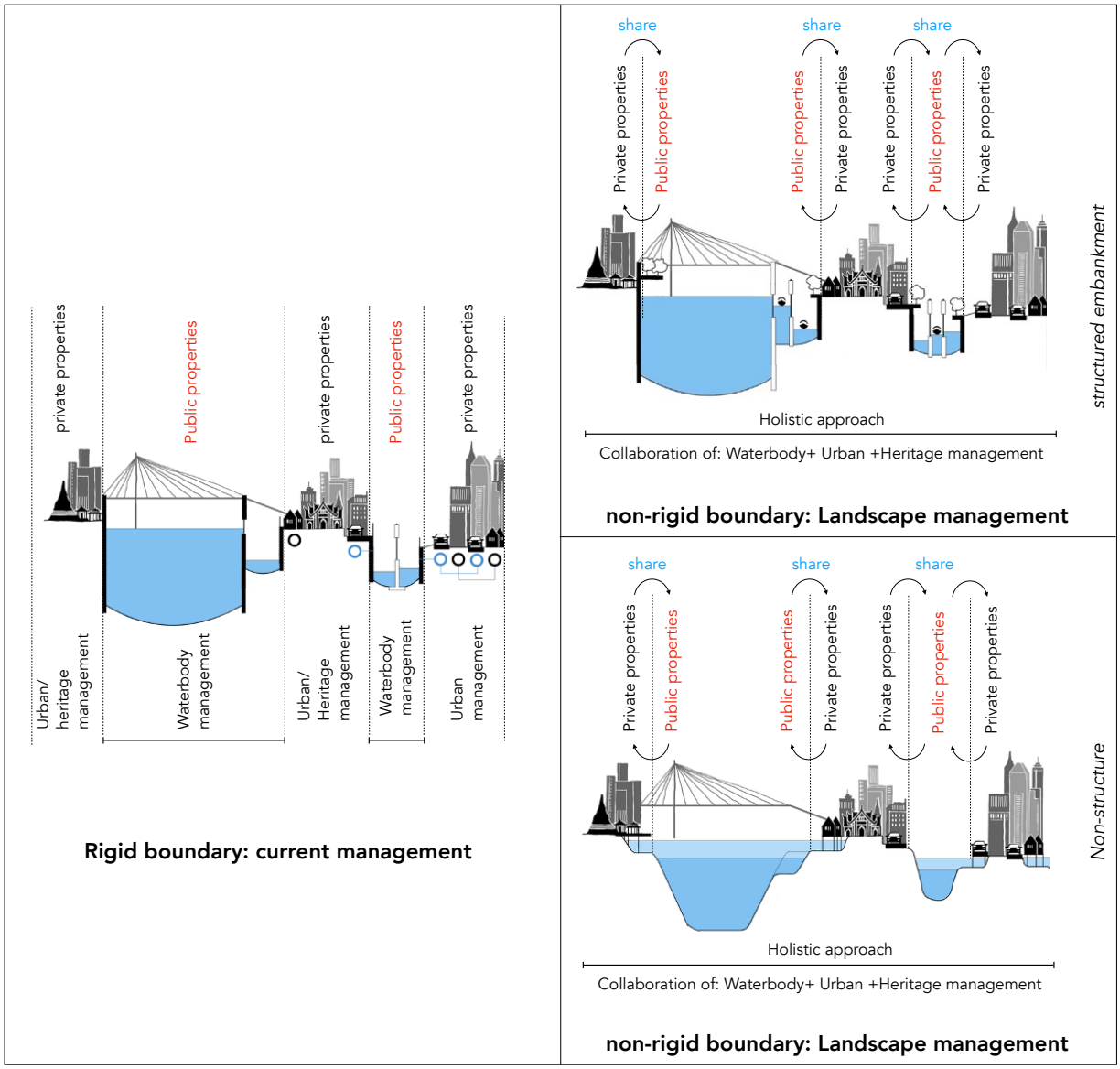


Fig 7-4 Rigid boundary (Left), and non-rigid boundaries of BUW as the landscape element: the structured embankment (Top-Right), and the non-structured BUW (Bottom-Right)

The findings emphasise that demarcating the boundaries of waterways for management purposes or assigning separate tasks to specific agencies is not conducive. Instead, a holistic landscape management approach, involving collaboration among stakeholders from both land and water sectors should be considered, as indicated by the workshops (Section 6.2.3/6.3).

Enhancing landscape knowledge in waterway decision-making would require transforming their perimeters (Section 6.2.3). Management stakeholders must begin to perceive these waterway edges as integral landscape elements rather than continuing to view them solely as embankment edges (Fig 7-4).

Landscape knowledge not only consider natural significance but also effectively addresses fundamental needs through a holistic approach to tackle issues such as poverty and insecurity (such as, IUCN, 2021, McPhillips et al., 2022). Occupying this approach requires the integration of multiple knowledge domains (Reed et al., 2016, Divay and Wolfe, 2002), including water

management in environmental crises, climate change consideration, spatial adaptation, natural restoration, and cultural landscape consideration. These domains were addressed by EP/IA, while GA/RE lacked acknowledgment (Section 5.4). These findings indicate the importance of involving multi-stakeholders to foster more holistic alternatives (Reed, 2008).

Expressing landscape knowledge poses a challenge in the Thai context, highlighting the significant potential of collective learning (Collins and Ison, 2009), as evidenced in Section 6.3. Knowledge exchange, as demonstrated in workshop findings, involving multiple expertise and stakeholders, can facilitate integrated landscape management. This approach requires an iterative process and experiential learning, emphasising a process-oriented approach (Fazey et al., 2012, Fazey et al., 2014). The involvement of a third party (e.g. NGO, facilitator) initially appears feasible in integrating knowledge within agencies and embracing landscape knowledge as part of a holistic approach in the Thai context.

This research recommends prioritising the initiation of landscape comprehension right from the inception of the educational journey. It emphasises the significance of foundational knowledge embedded in the standard educational curriculum of schools, especially for enhancing understanding among local communities. Subjects like geography and local history are pivotal in achieving this goal.

Importantly, the role of landscape architects and planners should be effectively positioned within government agencies. The educational sector, through Landscape Departments in Universities, must play a significant role in enhancing landscape knowledge within the GA system. They should be allocated roles that can influence policy formulation and decision-making rather than solely assisting with research efforts on a job-by-job basis- referring to the lack of research implementation (Section 5.3.6).

The policy formulation process should integrate diverse opinions and knowledge from various agencies right from the beginning of policy discussions (Selman, 2012). The agencies themselves should also receive training in more multi-disciplinary knowledge. While the current policy trajectory fails to recognise the value of BUW (Section 5.6), this thesis addresses the significance of addressing these landscape values (Section 6.2.3). It will occur through a multi-stakeholder approach, ensuring that the resulting alternatives are more comprehensive and can address solutions more holistically.

The role of the leader can effectively promote the integration of landscape knowledge and foster collaboration, as discussed in Section 7.3.1. For example, in the realm of flood management, which has traditionally relied heavily on engineering structures, a visionary leader (John and Cole, 1999), i.e., Bangkok Governor, could propose alternative approaches emphasising landscape initiatives like blue-green infrastructure, as examined in Amsterdam (Daisi, 2012), New York (Unakul, 2022), or water heritage in the Netherlands (Willems and Schaik, 2015). This could foster a more resilient and adaptable urban environment.

When the Governor possesses a visionary approach that breaks from convention, they could allocate resources and prioritise management efforts: balancing place-making and place-keeping (Smith et al., 2014) in alignment with the landscape approach. Complex tasks, such as

integrating knowledge (Fazey et al., 2012), could encompass both heritage preservation and water management across multiple streams. The establishment of regional water management plans that align with the natural landscape of waterways may indeed be made possible through the directive of a visionary Governor.

In terms of implementing the landscape approach, such as executing adaptable land use initiatives (Shinawatra, 2012, Aruninta, 2013), attention should be given to **policy** potential. Findings from the workshops underscore the necessity of policy incentives (Section 6.3.3). For example, the Comprehensive Plans by TPD should provide opportunities rather than impose restrictions, GA could consider offering tax incentives and risk insurance to landowners (G7/8-workshops).

As highlighted in Section 5.3.6 and 5.3.10, initiatives are sometimes not implemented. For example, the measurement of pavement utilisation ratios and the use of absorbent pavement for flood mitigation (GA-06), including the community-driven initiatives addressed in the 'Bangkok Resilience Strategy' by The Rockefeller Foundation (BMA, 2017), could hold substantial promise in the landscape approach if effectively enforced.

Workshop findings (Section 6.3) also address the significance of **plans** to facilitate an integrated approach, such as the systematic water management plans, regional plans, and spatial plans (G1/3/4-workshops). On a larger scale, there could be a comprehensive plan that encompasses various place-based projects or smaller-scale initiatives. For example, the role of the Banglampoo Canal within the overall BUW system, including water management aspects, needs careful consideration (G1/6/8). Examples of regional plans for hydrological system can be found, e.g., in Amsterdam (Holthuijsen and Ouboter, 2021) and the UK (Chan et al., 2015).

However, it is equally important to recognise that the identity of each place should be examined on a case-by-case basis (Section 6.3.1/6.3.4). This means that the tasks and patterns within Banpantom will not necessarily mirror those in Minburi or Talad Nongchok, as each area has distinct characteristics, cultures, and roles within the overall waterways system. Effective planning must account for these differences of cultural heritage and identity accordingly. This echoes in literature elsewhere (Harrison, 2013), reflecting the contextual and systematic landscape approach (such as Freeman et al., 2015).

7.5 Revealing local values through community-driven action

This discussion aligns with an understanding of values in BUW expressed by government agencies (GA) and residents (RE) (RQ 2.1/2.2) demonstrating potential in managing BUW considering flood and heritage management to pursue a more holistic approach (RQ 3.3).

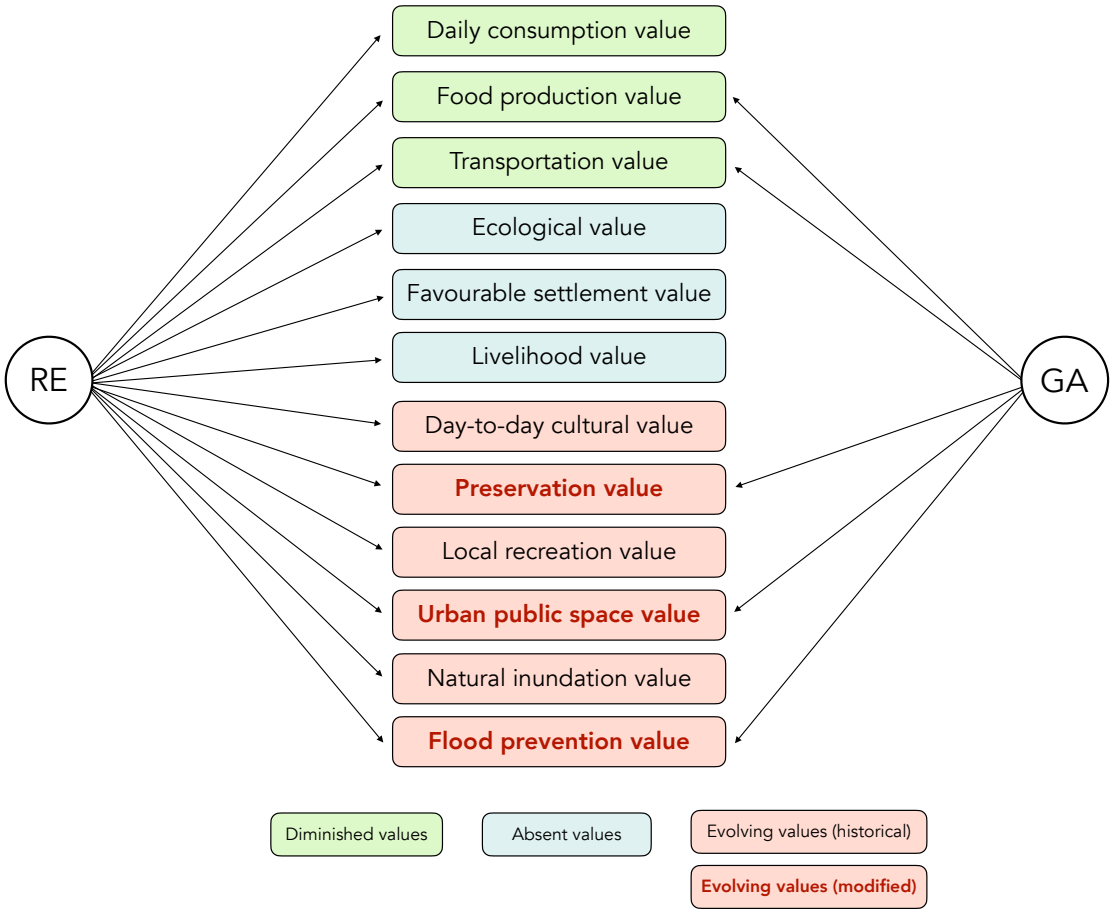


Fig 7-5 BUW's values from research's findings that RE addressed compared to GA

From Section 5.5, it becomes apparent that none of the GA involved fully recognised the values of the waterways, as identified as absent value (Section 6.2.1 (2)), and the historical version of evolving values (Section 6.2.1 (3)); indeed, they did not acknowledge them in policy documents (Section 5.6). Such values are presented in Fig 7-5. For example, water management agencies like DSD and RID did not take into account the values inherent in daily consumption, which is why considerations related to accessibility have been typically absent from their embankment design standards, as observed across all three study sites (Section 5.2). RC-ONEP,FAD, and TPD did not address the day-to-day cultural values of BUW, as represented by no project execution showing encouragement of 'locals' towards BUW. This is similar to the declined in value observed in Kampong Ayer, the traditional village in Brunei (Azman et al., 2021).

On the contrary, RE reflected more diverse values, including those described as absent and diminished, such as day-to-day cultural values and daily consumption values (Fig 7-5). This indicates that certain limitations exist in addressing values in management, which are not as

diverse as they should be. while locals are the ones who address comprehensive and in-depth dimensions of landscape values in waterways.

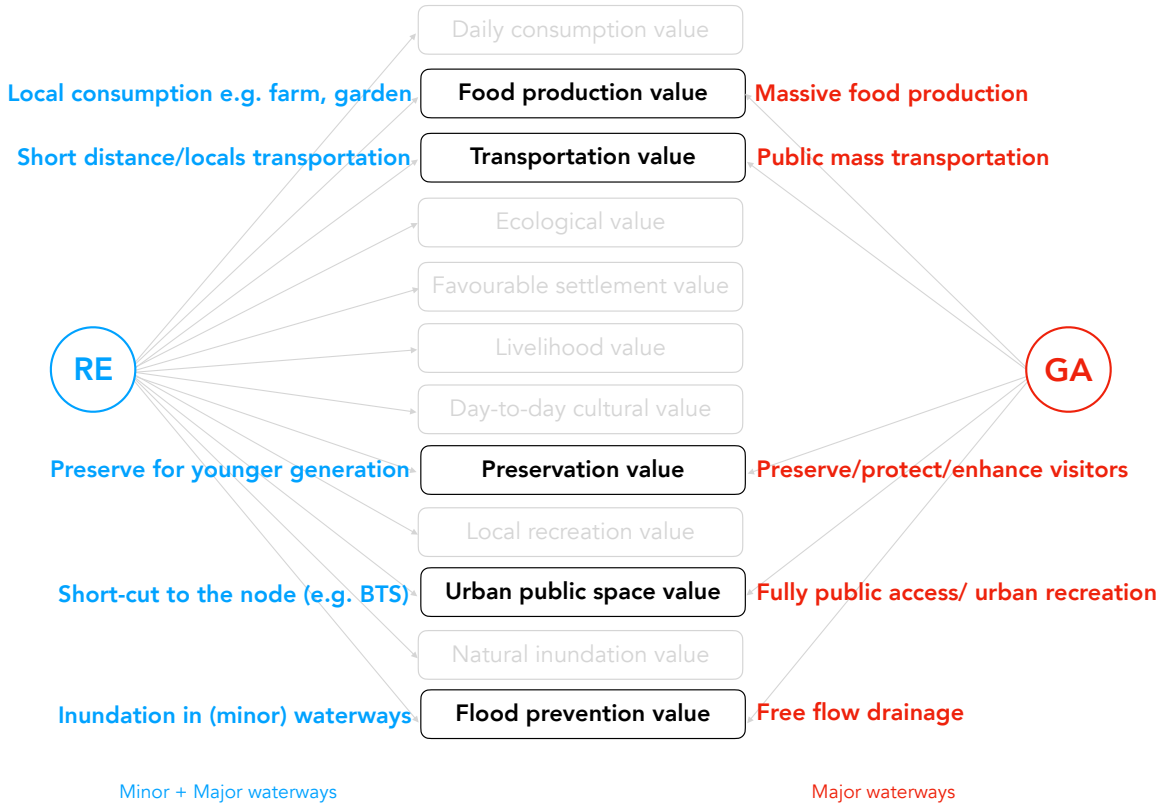


Fig 7-6 BUW's values expressed by RE compared to GA

Moreover, despite GA expressing diminished values related to food production and transportation, along with modified versions of evolving values, the findings highlight differences in their priorities (and confliction) compared to those of RE (Section 5.5, Fig 7-6). For instance, while RE prioritised the routine values of waterways for local food production, such as irrigating farms and gardens, GA emphasised the value of food production through large-scale irrigation projects. Findings indicate that GA's values are interpreted with a focus on large scale and urban function (discuss more in Section 7.6), leading to extensive modification of BUW, as discussed in Section 7.2, such as the use of watergates and structural measures.

Interestingly, RE acknowledged the importance of both small and major waterways, whereas GA made no mention of minor waterways whatsoever. RE addressed the values of BUW in the terms of learning to coexist with nature (Stephenson, 2008, Nassauer, 1995) and recognise its ecosystem services (Ehrlich and Mooney, 1983). The three evolving values, RE and GA, are discussed in Section 7.6.

Therefore, findings demonstrate that local residents can potentially contribute to BUW management practices in a more comprehensive manner considering their diversity of values held and their interpretation of values than GA alone. This aligns with the literature (Raymond et al., 2010, Berkes, 2004). Although there may not be a direct link to indigenous or tacit knowledge, the findings support the recommendation that a community-based approach is crucial for project proposals (Folke, 2004, Berkes et al., 2000), and should be integrated with

scientific knowledge from experts (Raymond et al., 2010). The findings indicate that residents intimately understand the values associated with the waterways as a natural landscape on an everyday basis. They play a vital role in maintaining (diminishing value), restoring (absent value), and sustaining (evolving values) the BUW landscape.

The research findings echo how locals have a strong connection with nature and possess extensive information about their neighbourhood's history (Kendle and Forbes, 1997), indicating that this deep understanding of values can contribute to an inclusive approach in management, avoiding the adoption of one singular perspective within an intricate landscape system. These findings are related to a community-based approach, as proposed by Berkes (2004). The lessons learned in Talad Nongchok, where a project focused on flood protection on the city scale, reiterate the importance of locals who should have been involved (Section 5.3.5).

Community involvement in flood management is recommended in Thailand (Jular, 2017, Rongwiriyaphanich, 2012). However, in Bangkok's context as a major city, a notable issue is the lack of cohesion in community structures (refer to Section 7.1) that needs to be addressed before considering community involvement.

For example, residential areas along the BUW typically have multiple property owners, and these owners may not always share the same perspectives or opinions. This diversity of opinions within the community can pose significant challenges, as seen in Talad Nongchok where some locals are willing to move and others to remain. These include individuals or families have often lived in the area for many years, possibly even generations, and have deep connections to the community. Their concerns and priorities might revolve around preserving the historical significance of the waterways. Meanwhile, some residents may have moved to the BUW area seeking better economic opportunities in Bangkok, either as newcomers from other provinces or immigrants. Their perspectives might prioritise economic stability and improved living conditions. Newcomers or renters can experience exclusion from the existing community's sense of belonging, which can overlook the integration of newcomers.

The analysis suggests an approach that involves actively engaging newcomers to foster a shared sense of belonging and shared goals, akin to the notion of 'share around the table' discussed previously (Section 7.2/7.3). Additionally, the involvement of facilitator or third parties (refer to Section 7.2/7.3/7.4) can aid in constructing of community harmony. This could simplify conflict resolution and strengthen negotiations with the GA later.

Effective community leadership also plays a crucial role in fostering strong community relations. Two types of leaders could be useful here: official leaders, representing the community in engagement with the GA, and hidden leaders, who are respected by residents but challenging to work with (Edinger, 1975). Transforming hidden leaders into official leaders is vital for promoting transparent two-way communication and fostering a more open and mutually beneficial relationship with the GA (HC-03). All of this facilitates community-driven efforts in recognising the diverse value of BUW. This research confirms that the values held by locals have the potential to shape management decisions.

7.6 Revealing absent values in managing BUW

This discussion outlines the conflict of values held (Section 7.1), including an understanding of evolving values (RQ2.2), their influences on decision-making for managing BUW (RQ2.3), and demonstrates their negative impact on implementation in practices surrounding BUW (RQ1.2).

7.6.1 Why BUW should (not) all be public space?

The reevaluation of spaces in modern times as valuable public areas is fueled by the rapid urbanisation of densely populated areas (McPhearson et al., 2022, Kendle and Forbes, 1997). Regarding BUW, findings indicate that this shift is characterised by a move from localised recreational value for residents (Section 5.5.9) to a broader focus on the overall well-being of city dwellers (Section 5.5.10). GA is reimagining these waterways-adjacent areas to function as public access pedestrian points, as described in urban development policies (Section 4.6.2), exemplified by projects along the Banglampoo Canal and the Sanseab Canal (Section 5.6). International initiatives underscore the benefits of public use and the creation of green spaces along waterways, such as the Amsterdam Canal Belt (Daisi, 2012).

The findings and analysis challenge the appropriateness of enhancing urban public space along BUW within the Thai context. According to Section 4.5.1, historical analysis reveals that residential areas have historically settled along waterways since the earliest settlements (Takaya, 1969, Siriphattanakun, 2020, McGrath et al., 2015). Until recently, areas along waterways have been utilised for residents, replaced in places by public pedestrian land use (Section 5.2.1), following the Comprehensive Plans (Section 4.6.2). Transforming these spaces into fully public access introduces a range of complex issues.

This shift in value –from a place of local recreation to a BUW urban public space – highlights the unforeseen or contradictory outcomes that can arise from actions implemented without community involvement. Observation from Minburi Upatum reveals that the change in ownership and boundary unexpectedly encourages intoxicated individuals at nighttime (Section 5.2.1) through the establishment of public access walkways in areas where houses are privately owned.

This urban public space value was expressed by GA without reference to the local recreational value and day-to-day cultural value (Section 5.6), leading to controversy surrounding relocation efforts. Considering the persistent and complex land ownership issues along waterway banks, as demonstrated in Talad Nongchok, the legal status of communities along Sanseab Canal remains ambiguous. The unclear ownership creates challenges (Section 5.2.3), leading to unequal advantages, particularly due to the lack of transparent compensation. Moreover, the temporary results of management action, such as tourist attraction initiatives (Section 4.3), including the introduction of bicycle routes in Banpantom in 2015 (EP-03/RE-01/02), eventually saw no sustained activity. This echoes in other initiatives and implementations along the historical canals in Rattanakosin (Aruninta, 2009).

Findings raises the question of whether this direction pursued by GA is appropriate, especially considering critical issues such as water quality, resident vulnerability, and flooding problems have not been prioritised. Despite these pressing concerns, GA continues to construct

embankments along canals in Bangkok, even though their effectiveness is questioned. Similar challenges are observed elsewhere, such as in Ahmedabad, India (Dempsey et al., 2017).

This trend may be attributed to the fact that enhancing public space is one of the few tasks over which the BMA has autonomy to contribute (Sevilla, 2012). In contrast, tasks like water transportation, preservation, and water management are not directly under the control of BMA and involve national stakeholders, as presented in GA's structure in Section 4.2.

Regarding this value of urban public space, Figure 7-6 shows how RE identify particular areas adjacent to BUW as pedestrian pathways, aiming to enhance access to key nodes like the Sky Train transportation system. Conversely, GA prioritise the creation of 'fully' accessible public spaces and encourage urban recreation (Section 5.5.10). The findings lead to the conclusion that- it is neither feasible nor advisable to designate all areas along BUW as fully accessible to the public. Rather, attention should be focused on areas with the potential to effectively improve accessibility, particularly those capable of connecting to important nodes. Simultaneously, consideration of the local dimension must be taken into account (Raymond et al., 2010).

7.6.2 The forgotten detention role of flood prevention value in BUW

While the fundamental function of the waterway remains that of confining and channelling water (Section 4.5.1), its present value has been reshaped towards preventing water levels from exceeding certain thresholds and causing flooding in the surrounding areas, as presented in BUW's role in flood prevention policies (Section 4.4). The findings demonstrate that the value of flood prevention has shifted from natural inundation processes to serving urban needs. This shift has given rise to distinct roles for BUW, including retaining water as detention areas, which allow water to accumulate during inundation events (Section 5.5.11) and facilitating the free flow of water or drainage to guide water out of the area (Section 5.5.12).

As the soft landscape has never been integrated into BUW management, this has contributed to ineffectiveness and social inequality in Bangkok (Marks, 2016, Marks et al., 2020, Ratanawaraha, 2016a), as evidenced in Minburi Upatum (Section 5.2.7). Findings indicate that a key factor shaping the current state of structural measures in BUW is the GA's prioritisation of designating them solely as free-flowing drainage channels. This reflects the implementation of drainage role by DSD in BUW, while neglecting the detention role in the flood prevention strategies.

The workshop participants identified the limitation of BUW's drainage role, where the requirement for free-flowing drainage necessitates embankment construction along BUW. The stability of these structures relies on the interplay of water force and soil. However, these structures are vulnerable to fractures during dry periods, as observed in the damaged embankment in Talad Nongchok (Section 5.2.1). The flat topography of Bangkok does not facilitate the rapid flow of waterways as aimed by the DSD. Despite the installation of pumps for water diversion, their effectiveness is limited, as seen in the case of the Sanseab Canal, which spans a significant length (G2/4/6). As a result, water seeps into the surrounding terrain, sustaining its levels topographically instead of moving quickly and remain contained within the waterways' boundaries, even with the high embankment structures (G5/6/7).

As outlined in Chapter 4 (Section 4.5/4.6), the historical development of water agencies in Bangkok indicates clear changes in priorities. The Canal Department prioritised transportation and excavation, followed by the Irrigation Department emphasising massive food production. The most recent Drainage and Sewage Department focuses primarily on drainage. The empirical findings further show that individuals interviewed from the GA did not recognise the natural inundation value of waterways. This lack of acknowledgement may be attributed to their insufficient understanding of BUW, which can serve as detention areas as described by EP/IA and RE (Section 5.5.12).

The findings show that EP/IA and RE comprehended the natural inundation and flood prevention values of BUW, leading them to view BUW as potential detention areas (Section 5.5.12). This understanding is reflected in EP's recommendation for a scenario of natural restoration (Section 5.4.2), where the alternative enhances the detention role of interconnected waterways, promoting the concept of resilient cities, as extensively studied in academical research (e.g. Thaitakoo et al, 2012).

However, GA finds natural restoration challenging, evidenced in Section 6.4.2. This is because their prioritisation of a predominant drainage-centric role does not readily align with the restoration of natural flow. Findings reiterate that implementing detention in BUW requires a substantial increase in effort and collaboration. The waterways would cease to function solely as channels and become integral landscape elements, deviating from DSD's intended purpose of free-flowing drainage (Section 4.4 and 5.5.12). Recognising the importance of the detention role in the landscape concept necessitates a process-oriented approach to value restoration, which is significant in managing intricate environments and landscapes (Zube, 1987, Dunham et al., 2018).

Findings indicate that recent metrics of Thailand's working structure rely on short-term strategies that provide more rapid outcomes than process-oriented ones (Section 6.4.3). The BUW's drainage role leads to the use of sandbag walls for flood prevention, which examplifies temporary implementation or short-term strategies (Section 4.4). This echoed the neglect of long-term and place-keeping considerations (Smith et al., 2014, Dempsey et al., 2014).

Findings in Section 6.4.3 indicate that restoring BUW to serve the detention role and facilitate natural restoration encounters obstacles in demonstrating progress, with unpredictable outcomes and extended timeframes. Making new proposals or changing the objectives of completed projects is often considered impossible (Section 6.4.2). While the current working structure in Thailand and Bangkok is somewhat unfit, this necessitates a substantial shift in management mindset (Fig 7-2 Right/ 7-4 Right). The recommendation for institutional collaboration is developed in Section 7.8.

7.6.3 Challenging the concept of water-heritage in Bangkok: Preservation value

The conservative approach to water infrastructural heritage is rooted in preserving value through a long-standing history (Hunter, 2022, Hein et al., 2020). In the case of Rattanakosin, the excavation of canals is considered significant for water infrastructure (transportation, nodes for trading, defensive, food production, etc.) which has been highly preserved within the conservation zone, i.e., Rattanakosin or Old Town Bangkok (Section 4.3). However, within the

intricate context of Bangkok, conservation management has led to social inequality and vulnerability, extensively studies since the implementation of Rattanakosin Plans (Sirisrisak, 2009, Sirisrisak and Akagawa, 2012, Issarathumnoon, 2020).

This thesis delves deeper into the phenomenon stemming from the altered values held by management stakeholders. The emphasis on preservation values illustrates the transformation of waterways from vibrant hubs of local activities and daily rituals to symbols of revered historical significance in the present context. The oversight of the once integral day-to-day cultural value is evident in the prioritisation projects aimed at attracting tourists and outsiders in conservation zones (Section 4.3), also echoes in Banpantom (Section 5.5.8). This echoes in heritage cities in China like Zhouzhuang and Wuzhen (Liu and Shu, 2020).

The findings further illuminate the deliberations concerning the Banglampoo Canal within workshops involving preservation-oriented participants. Their standpoint is rooted in a robust dedication to preservation values, as exemplified by statements made during their discussions on natural restoration scenario. One participant argued, *"The old town has been protected since the city was established by the city wall. […] Areas have never been flooded. Why should we consider allowing more water to come? (HC-06)"*

While academics recognise the significance of the cultural landscape and integrate flooding management solutions (Shinawatra, 2012, Aruninta et al., 2020), their adoption to policy and management practice in BUW has never been found, as presented in the lack of integration between conservation (Section 4.3) and flood prevention policies (Section 4.4). This thesis explains this obstruction, which could arise from the prevailing emphasis on preservation values without considering day-to-day cultural value, suggesting that it hampers a holistic landscape approach.

Findings indicate that how evolving values of preservation have a dual influence, contributing to social inequality and emphasising the divide between heritage preservation and flood mitigation. This is because the prevailing notion in preservation efforts is to maintain the conservation area in a dry condition, a belief that has persisted throughout history. This aligns with path dependence (Rohring and Gailing, 2012), where decision-making processes have remained unchanged over time, with the primary focus here being the protection of the Old Town. This is also evident in the construction of river dykes to safeguard inner Bangkok, indicating a reliance on established structural measures. Consequently, management efforts for the Old Town have not prioritised integrating flood mitigation measures with heritage preservation, as they adhere to the belief that the Old Town must remain highly protected.

This thesis challenges the current practice of compartmentalising social (heritage management) and environmental problems (flood management), demonstrating that they are interconnected and should be addressed concurrently within the Old Town Bangkok.

International literature on water heritage conveys an interpretation that emphasises an adaptive design to preserving cities as integrated entities (Willems and Schaik, 2015, Hein et al., 2020). While it is true that BUW differs significantly from the waterways in developed countries like the Netherlands or the UK, this thesis contends that valuing waterways in a similar manner

offers an interesting exemplar perspective. This perspective contrasts with Bangkok's values of waterways. In conservation areas, there is no evidence of BUW's management of any values except heritage preservation (Section 4.3 and 5.6), whereas the concept of water heritage in international literature allows for both heritage and natural significance (Hein et al., 2020).

The specific series of workshops concerning Banpantom unveil a collective understanding of natural and cultural significance. A practical suggestion emerged: *"If the water could flow, let's prioritise areas for public use over private settlements (G-08)".* The group's openness to finding compromises suggests that, at the very least, the areas within BUW, whether protected or not, have the potential to enhance the city by addressing values beyond just preservation (Section 6.2.3). Their expression of day-to-day cultural value is underpinned by the belief that this could strengthen the relationship between people and the waterways when they could tangibly visualise them (Stephenson, 2008, Nassauer, 1995).

The discussion surrounding BUW within the conservation zone as adaptable poses a challenge for this thesis in arriving at a conclusive standpoint regarding the existing status of the highly protected zone or the fixed understanding of the meaning of 'heritage', as evidenced throughout policies (Section 4.3) and empirical data from GA (Section 5.5.8). This challenge is particularly pronounced given that the management of protected or conservation areas often hinges on steadfast beliefs in their unalterable nature (Hunter, 2022).

The findings and analysis seek to challenge the dominant management mindset in BUW, advocating for a more open-minded approach, i.e., the water-heritage concept, which transcends the perception of unalterable areas. The example of the Netherlands prior to embracing NBS demonstrates a comparable challenge in overcoming reliance on conservative engineering solutions (Willems and Schaik, 2015). The aim is to foster openness and shared objectives with a natural dimension, emphasising a broader perspective of landscape beyond solely protecting historical waterways. Instead, the focus is on viewing BUW in the conservation area as significant in terms of both day-to-day cultural heritage and natural landscape.

7.7 Decision-making and held values: dilemmas in public goods and local benefit

This discussion focuses on elucidating the values held by stakeholders with diverse objectives (RQ 2.1) and illustrates the significant roles these values can play in decision-making processes (RQ 3.1), particularly in cases where collaboration occurs (RQ 3.3).

An initial observation is that values can influence the framing of knowledge used in decision-making (Elliott, 2011, Choo, 2002), as illustrated in Section 6.2. This involves stakeholders adopting diverse values and generating knowledge. This is shown in the exploration of alternative scenarios by stakeholders for the future of BUW, such as concepts like natural restoration considering ecological or biodiversity value (Section 5.4).

The findings from individual tasks underscore the prevalent dilemma between public goods and local benefits. An instance of this dilemma is evident in the management of Banglampoo Canal: should it primarily serve the residents of Banpantom or symbolise the historical elements of Bangkok? A similar deliberation unfolds in Minburi Upatum, where the role of Sanseab Canal is

contested between supporting the urban function of TOD or delivering direct benefits to the local population. In Talad Nongchok, the perspective on the Sanseab Canal oscillates between its role as a means to divert water for urban purposes and as a resource to improve the daily lives of local residents (Section 6.2.2/6.2.3).

Findings from section 6.4.4 also indicate the examination of conflicting considerations, where priority is placed on either benefiting local profits or serving the broader public interest. It poses a dilemma that appears challenging to reconcile common ground. In addressing flood issues, the focus on collective goods for the entire city tends to overshadow the often overlooked "livelihood values" from which locals have benefited.

This hinges directly on the concept of an arbitrating role and a facilitating role, wherein decision-makers must decide between prioritising advancements in economic growth and urban functionality, and an approach that prioritises options considering environmental impact and people's ways of living (Todt and Lujan, 2014).

During the workshops, the findings uncovered values held by participants while engaging in group exercises, emphasising a more holistic approach to addressing inherent environmental and social inequality (Section 6.2.3). For instance, the presence of livelihood values in all eight workshops, which were absent when individuals were asked, indicates that a more diverse group of people with various expertise can contribute to a different, potentially more comprehensive and integrated approach through their collaborative input (Lecuyera et al., 2018, Dobson and Dempsey, 2021).

This hinges on the anarchic mode, where participants explore goals and devise solutions in unfamiliar situations—a departure from the boundedly rational mode (Choo, 2002) employed by the GA, which tends to apply stored long-standing rules uniformly to all BUW, regardless of local contextual differences. Furthermore, the workshop activity aligns with the process of collective sharing recommended for addressing inherent problems (Raymond et al., 2010), and the methodological learning in the decision-making process, wherein tailored knowledge explicitly designed for specific decisions (Todt and Lujan, 2014), is exemplified in the three communities (Section 6.3).

This illustrates how solutions can be crafted through the collaborative efforts of experts sharing their interests and bridging gaps in each other's knowledge. It reveals that the distinct (and artificial) separation of expertise, such as natural against structural measures, can be brought together and integrated during the workshop (Section 6.2).

The findings lead to the recommendation of shared benefits grounded in balances and trade-offs in the decision-making (Lele et al., 2023, Bell et al., 1977), incorporating both private and public interests. Banpantom serves as an illustration of the potential for shared advantages among public areas, commercial zones, and the livelihoods of the community along the Banglampoo Canal. Such an arrangement could benefit the GA, locals, and urban dwellers, fostering a relationship and reaping benefits from the Banglampoo Canal (Section 6.3.4). The challenge lies in identifying common ground, as discussed in the manner of collaboration in Section 7.3 and 7.4, where diverse values converge, serving as an anchor point to maintain the intended (shared) direction.

Striking a balance or reaching a shared benefit can pose challenges, particularly when factoring in the implications of flooding. Landscape knowledge directs attention to the idea that there should be no differentiation between protected and non-protected areas. This aligns with the idea of Landscape Character Assessment (Butler and Berglund, 2012), where character extends beyond just the most pleasing ('best') landscapes and is closely intertwined with the range of values attributed to the landscape itself (Butler, 2016). The landscape approach would demand more equity, such as aiming for unrestricted water flows throughout the BUW network, rather than causing localised flooding impacts. This concept aligns with the notion of a city's blue infrastructure, functioning as a shared public benefit (McPhillips et al., 2022).

7.8 Example of institutional collaboration in occupying landscape approach

Figure 7-8 illustrates the example of an institutional collaboration for managing BUW through a landscape approach, drawing from the interpretation of the research findings. It is crucial to note that the positions of each agency depicted in Figure 7-7 belong to either national or local administration, as elaborated in Section 4.2. Nevertheless, the collaboration example highlighted here underscores the importance of smooth coordination between national and local authorities, as outlined in Figure 7-2 Right. In this example, these agencies reflect their respective responsibilities identified through the research findings.

The initial group (1) in Figure 7-8 favours waterways as integral landscape components, emphasising the need to comprehend their ecological systems or landscape ecology. The objective is to encourage agencies to view waterways as complex entities through the understanding of landscape approach and beyond mere free-flowing drainage or irrigation channels. Consequently, agencies responsible for water management, such as DSD, RID, ONWR, and MAD, should collaborate to enhance their understanding of waterways in this context.

The second group (2) views waterways as an integral part of the landscape without imposing rigid boundaries (refer to Fig 7-4). In areas adjacent to waterways or land sectors, the collaborative model among these agencies should position waterways within planning and policies as landscape elements. The consideration of any effort to town planning or development must take BUW in their accounts. Agencies responsible for town planning, policy, and area management should recognise the significance of waterways holistically within the urban landscape and beyond the municipal scale. Recognised agencies include PWTPD, TPD, PWD, TTP, and LAD.

The third group (3) views waterways as integral to cultural landscape significance. Agencies responsible for conservation management, like RC-ONEP and FAD, should collaborate with those overseeing water management, such as DSD and AED-BMA, and also with the first group (1). This collaboration aims to enrich the cultural significance of waterways beyond conservation zones, incorporating elements like local food production in the context of cultural significance. In this broader perspective, collaboration with the second group (2), which focuses on urban contexts, is essential. Initiatives like heritage urban landscape can further enhance this holistic approach.

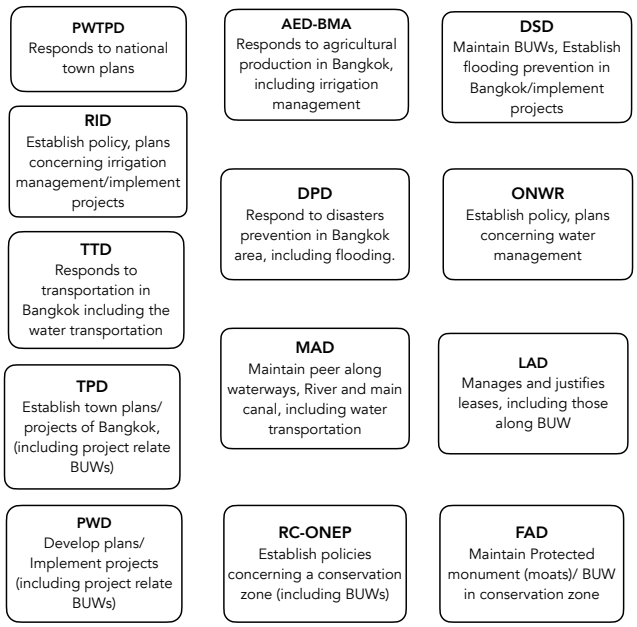


Fig 7-7 Agencies concerning management action relation to BUW (refer to Chapter 4)

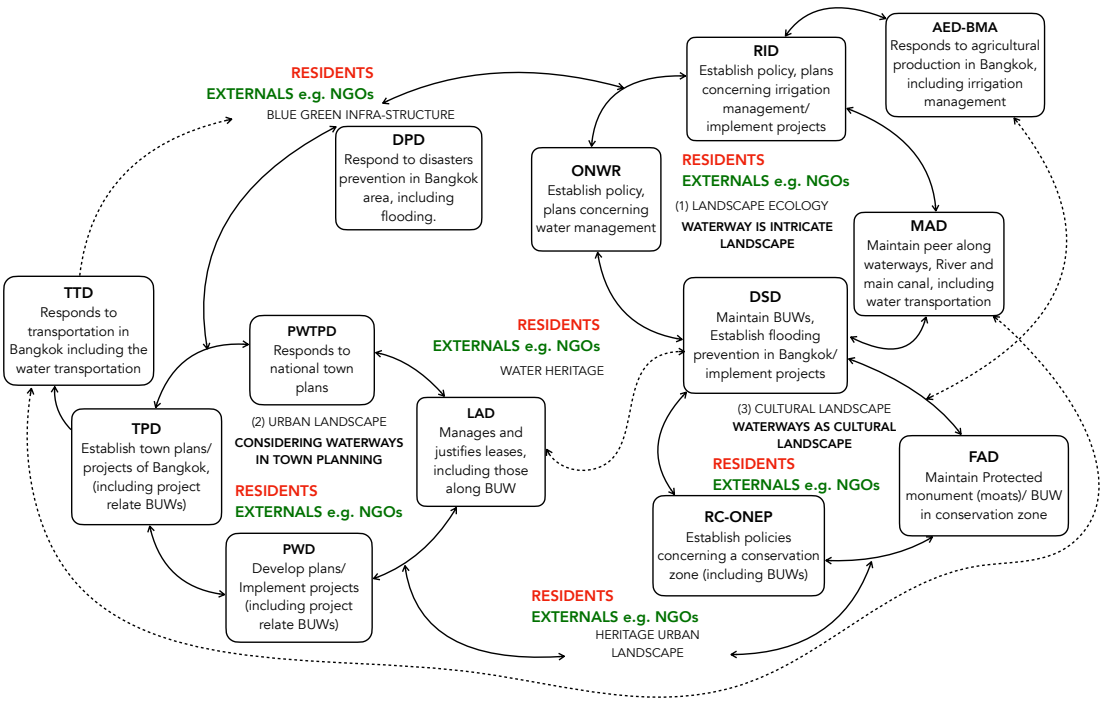


Fig 7-8 Examples of institutional collaboration concerning landscape approach in managing BUW

Collaboration between the first (1) and second (2) groups can lead to joint projects like blue-green infrastructure, benefiting both flood mitigation and landscape enhancement. Moreover, the collaboration among all three groups (1,2,3), focusing on initiatives such as water-heritage, promises to yield public and local benefits, addressing various aspects of nature, social, and cultural landscapes. Essentially, the multi-stakeholders must be taken into account. External entities like educational institutions or NGOs could significantly contribute by being involved, educating agencies, integrating knowledge, and aiding in the effective formulation of policies and planning directions. It is essential that local communities actively participate and contribute to all decision-making processes.

Chapter 8 Conclusion

8.1 Introduction

The concluding chapter begins with Section 8.2, which analyses and succinctly synthesises the findings related to each research question, offering a comprehensive overview of the contribution that this research makes to knowledge. Section 8.3 expands the focus to outline recommendations for future change, emphasising the implications of the findings. Section 8.4 presents the recommendations for studying the change and value of urban landscapes. Finally, Section 8.5 wraps up the chapter by offering suggestions and discussing necessary changes in practice and policy proposing potential areas for research in this domain, before addressing the potential for future research to address the limitations of this thesis (Section 8.6)

8.2 Contribution to knowledge

This study makes a methodological contribution by adopting a social constructionist approach (Burr, 2015, Galbin, 2014), which prioritises empirical data collection through stakeholder-led research. The study enriches the field of landscape architecture with valuable data on governance and decision-making in urban Thailand, constituting a comprehensive extension of existing research inquiries. For instance, activities like focus groups (Nyumba et al., 2017), which are not frequently used in the Thai context, provide in-depth findings when investigating the decision-making process. The qualitative approach (Ritchie et al., 2013), which includes practices such as go-along interviews (Rishbeth, 2020) conducted with residents in their community settings, is also used effectively to rigorously understand stakeholders with regard to their social-cultural standpoints and natural standpoints. Utilising the three-horizons approach (Sharpe et al., 2016) to structure data collection facilitates clarity and ensures that research activities are conducted effectively with participants.

The research provides useful contributions to different stakeholders concerning BUW management and facilitating landscape management in Thailand. The research provides direct contributions to academics in terms of perspectives, i.e., landscape management, in studying urban landscapes in Bangkok, including the methodologically innovative approach taken (Section 8.4).

Government agencies can benefit from the recommendation (Section 8.5.1/8.5.2/8.5.5) as the actors influencing changes in the BUW (RQ 1.1/1.2/2.3). There is also potential for the findings to be shared with the local communities, which may help them acknowledge their roles (Section 8.5.5), and their significance (RQ 2.1/2.2) in decision-making processes. The in-depth historical study will be shared with the local communities, and this is hope that they will benefit from an understanding of the changing landscape at the local scales.

Experts and practitioners, including educational institutions, can benefit from this research (Section 8.5.3/8.5.4) concerning their potential roles in governance to influence alternatives in decision-making (RQ 2.1/3.1/3.2). The findings further contribute to the collective roles of all stakeholders (Section 8.5.2/8.5.6) as they collaborate (RQ 3.2/3.3).

This research examines the context of Bangkok as an example of cities in Asia and Southeast Asia. By delving into the intricacies of Bangkok's urban landscape of waterways, this study can offer insights into the examination of urban landscapes and how landscape values are considered in the context of Bangkok. Consequently, this study can serve as a valuable example for other Asian cities grappling with similar challenges, including cities like Jakarta and Ho Chi Min City, Ahmedabad in India, or water villages in Brunei, and in China likes Tohgli and Zhouzhuang. This research in Bangkok expands the discourse on urban landscapes in non-western countries, revealing how values are made manifest in urban settings across the region.

RQ 1.1: What is the process of urban landscape change, and how does the governance of BUW contribute to it?

The transformation of BUW embodies a complex process driven by the intricate dynamics of human intervention. These transformations, such as the degradation of natural conditions and deterioration in water quality in BUW, are not solely attributed to urbanisation alone. Instead, they predominantly stem from structural encroachments and controlled water flow, contributing to alterations in inundation patterns. Additionally, these actions result in reduced accessibility, shifts in settlement patterns, and complexities in land ownership. Concurrently, the examination of BUW governance exposes its influence on the current changes in BUW, especially through the performance and structure of government agencies (GA). This research confirms that the ongoing institutional structure and working processes, including the relationship between GA themselves and with locals, are inadequate for effectively managing the intricate landscape of BUW. Agency-centric approaches with restricted knowledge have led to the implementation of a standardised embankment strategy across BUW. Additionally, fragmented and insufficient communication, along with ineffective local engagement, has further hindered holistic management efforts in BUW.

RQ 1.2: To what extent has the policy rhetoric around BUW been implemented in practice?

The research finds that the alterations BUW are intricately tied to the tasks implemented, often leading to actions that diverge from their original intent. The implementation of tasks has apparently caused social inequality and insufficient outcomes in practice. For example, the enhancement of urban public space along the area adjacent to the Sanseab Canal and Minburi Upatum has led to ineffectiveness in function due to the disconnection of routes, causing the local community to lose their privacy. Flood prevention through embankment construction to protect the Bangkok Outer Area in Talad Nongchok exemplified ineffectual tasks, as the broken dam inadvertently impacts residents and has led to issues like contentious relocation processes without transparent compensation. Conservation efforts to reorder the areas adjacent to the Banglampoo Canal in Banpantom resulted in the ignoring of local livelihood needs and prioritising visitors. Aspects of local accessibility and daily consumption are largely disregarded, presenting social inequality particularly for residents.

RQ 2.1: How are landscape value and landscape management expressed by stakeholders, particularly those in flooding and heritage management?

The interviews reveal that stakeholder-driven management approach to envisioning future change for BUW presents various perspectives based on their individual expertise and interests.

GA prioritise ongoing management actions like enforcing boundaries along BUW edges and enhancing structural measures, with a focus on urban people and visitors. Experts, NGOs, and residents advocate for more alternative approaches depending on their interests, including considerations of natural or cultural significance, such as restoring water flow and adopting flexible land use practices, and inherent local accessibility. Landscape values associated with BUW, recognised by residents, experts, and NGOs, go beyond the limited conceptualisation and understanding expressed by the GA. Stakeholders involved in flooding and heritage management emphasise flood prevention and preservation values respectively, each advocating for their priorities separately.

RQ 2.2 To what extent do the stakeholders' interpretations of landscape value change over time?

The examination of BUW's landscape values reveals a historical shift among stakeholders. Residents continue to value waterways, although values like daily consumption, livelihoods, ecological or biodiversity, and favourable settlement have diminished or disappeared. GA primarily value BUW for its role in urban settings, as a modified version of evolving values, likes urban public space, preservation, and flood prevention. In contrast, residents attribute values to BUW related to local recreation, day-to-day cultural values, and natural inundation. Discrepancies between GA and locals are evident in their interpretation of values; for instance, locals emphasise food production for local consumption, whereas GA prioritises it on a larger, more industrial scale. Water transportation value, in supporting the urban city as a whole is recognised by GA, while residents realise its local function as more significant. The interpretation of flood prevention value also presents differences, with GA emphasising free-flowing drainage and other stakeholders; residents, experts, practitioners, and NGOs focusing on water detention roles.

RQ 2.3: How is landscape value manifested in relation to the management of BUW?

The research illustrates how landscape values have constructed the direction of the BUW management plan. The values held (or not held) influence specific interests and highlight the consequences of changes and errors. The absence of values around daily consumption and day-to-day cultural held by GA has arguably resulted in a lack of planned accessibility in embankments constructed along BUW. There is no evidence that local considerations are included in decision-making processes; instead, there is a predominant preference for catering to visitors or promoting tourist attractions in conservation plans. Similarly, the planning of BUW's edge as a public pedestrian route reflects recognition of the value placed on urban public space, while the value of local recreation remains unrecognised. Neglecting the value of natural inundation, crucial for understanding the waterway-detention role, has led to treating BUW solely as a channel. Together with the value of flood prevention, which occupies the managers, this has prompted proposals for embankment construction across BUW to serve as channels for free-flowing drainage.

RQ 3.1: How is knowledge from different stakeholders interpreted when considering landscape change and management alternatives?

The findings from interviews demonstrate varying professional and local interests in approaches to BUW management. GA focus on enhancing ongoing management practices and promoting

urban functionality in line with their policy directives and accumulated knowledge. In contrast, other stakeholders explore more diverse alternatives: residents prioritise local livelihoods based on their experience knowledge and use of BUW, while experts, practitioners and NGOs consider alternative strategies based on their academic expertise. Workshop activities further illustrate how different disciplines approach BUW differently. For instance, water engineers prioritise issues related to water bodies, such as improving wastewater treatment through enhancing structural capacities. Preservationists emphasise place-based considerations, focusing on enhancing heritage conservation efforts on historical canals. These findings highlight the challenges of adopting holistic approaches, when stakeholders from various disciplines and roles perceive BUW issues differently. The landscape value of BUW is also often limited in individual recommendations, particularly overlooking the value of local livelihoods, highlighting the absence of local knowledge.

RQ 3.2: How is knowledge interpreted when stakeholders collaboratively consider landscape change and management alternatives?

An investigation into the expression of knowledge in decision-making through workshops uncovers a wealth of diverse perspectives held by participants. Their collective sharing is formed through integrating expertise from various experts, reflecting the respective values they hold and express. For example, integrating knowledge pertaining to non-human or natural significance with human-centred or cultural significance demonstrates the incorporation of a wide range of values during discussions. The research shows that decision-making processes can involve careful consideration of various management alternatives. Collaborative discussions in workshops led to its inclusion in integrating alternatives to a more holistic approach for BUW management. The findings underscore the significant influence of values on shaping knowledge, and the importance of harnessing different expressions of values within decision-making processes.

RQ 3.3: How can shared visions of Bangkok's future waterways be achieved, and barriers be addressed?

The research addresses barriers by examining government processes in BUW management, highlighting existing hindrances and obstructions within the working structure. The consideration of prioritisation reveals significant challenges in decision-making, with a tendency to prioritise short-term gains over long-term benefits, as the visible and quick outcomes of actions, such as increasing the number of pumps, are more appealing than the gradual progress of natural restoration. Furthermore, the values influencing specific implementations demonstrate that changes or the absence of values can serve as barriers and influence the unfortunate outcomes of certain implementations. The shared vision for BUW in the future could be achieved through collaborative efforts. The findings underscore that separated expertise and values can be effectively integrated during workshops, provided stakeholders share a common goal of finding solutions to overcome the complicated tasks of managing the landscape of BUW.

8.3 Recommendations for future change of BUW

8.3.1 Governance dynamics intertwined with landscape change

The observed changes in BUW landscapes underscore the profound influence of governance on shaping their trajectory. The research findings outline how agency operational procedures has directly contributed to the negative change of BUW. The recommendation underscores the importance of exercising caution in any actions that could potentially adversely affect the intricate urban landscape of BUW. Cooperation and transparent data among GA with adaptive management (after Folke et al., 2005) are highly recommended to address effective communication when proposing any actions. Holding local authorities accountable for the direction of BUW's change is also crucial in this context. Employing tools like the three-horizon approach approach (after Sharpe et al., 2016) could assist in shaping government decision-making processes as they navigate complex landscape changes.

Collaboration among stakeholders (such as Armitage et al., 2008) is therefore crucial in addressing these complex challenges present in the contemporary urban environments of Bangkok. Through collaborative efforts, stakeholders can effectively understand the complexity of landscape elements in BUW and rigorously address challenges. Educational sectors also have the potential to enhance GA's understanding of the intricate urban landscapes, recognising that individual actions by a single GA can significantly influence the complex landscape dynamics as a system. These implications are also useful to reflect on in other Asian cities facing similar challenges, such as the degradation of urban landscapes in Jakarta and Ho Chi Minh City, or the negative changes in the Sabarmati River in India, all influenced by decisions made by their governments.

The study highlights the critical significance of expressing the interplay between management actions and landscape transformations. Without a comprehensive understanding of how institutions drive landscape change, efforts to prevent or mitigate degradation may remain stagnant. Landscape or environmental studies in Thailand should prioritise an extensive understanding of governance and management actions. An examination of the institutional structures that contribute to obstruction is recommended to further investigation to facilitate more rigorous structural reform and enhance efficacy in BUW management, thereby fostering positive landscape transformations.

8.3.2 Significance of values in the future and roles in shaping decision-making processes

Although there have been negative alterations or degradations, research findings indicate that stakeholders still hold diverse and positive landscape values towards BUW. The ongoing trajectory of change is directly influenced by these diverse values as they shape the BUW environment. Therefore, informing landscape values could be highly significant for BUW's future change.

This research recommends re-evaluating BUW as landscape elements that comprise various values such as ecosystem service and cultural significance. It advocates for enhancing environmental quality, community well-being, and local inclusivity in the future. This should be addressed among the GA related to managing BUW as a landscape element. Changes in the

current routine tasks within GA should be considered to align with this research's recommendation— to consider this as a strategy implementation through the routinisation of operations, as discussed in the case of railway management in the Netherlands (Merkus et al., 2019).

This thesis demonstrates that BUW's values can be integrated and are crucially constructed to form knowledge that informs the decision-making process (such as Lele et al., 2023). Enhanced knowledge integration, therefore, is necessary to incorporate landscape values into policy and planning decisions. The concept of 'chairs around the table' (Forman, 2008) could be adopted here, involving educational institutions or academics, which can contribute to long-term knowledge enhancement within the agency.

While there has been a disconnect between the flood prevention value and the cultural heritage value of BUW in management practices, the study suggests a strong embedded relationship between these two values. Their integration is highly recommended. To pursue the integration, cooperation between flood management and heritage management is needed, supported by effective leadership to enable seamless cooperation and facilitated by third parties such as NGOs or educational institutions.

This underscores the need to establish partnerships (Slater et al., 2007) with stakeholders involved in flood mitigation and cultural heritage consideration, including landscape and water resource engineering departments from universities, agencies like DSD, RC-ONEP, FAD, and TPD, practitioners, and the local representatives from the BUW community. Given the invaluable local knowledge (Raymond et al., 2010) constructed from the community's value occupation, locals should also be accorded real involvement. In this regard, effective local involvement (Arnstein, 1969) which reaches shared benefits (Healey, 2006), including community-driven initiatives (such as Berkes, 2004), is recommended.

The value and landscape assessment study (Butler, 2016) pertaining to BUW is recommended for observation, particularly within government agencies whose roles directly involve landscapes. This broader approach can lead to a more comprehensive understanding of how to assess the character of landscapes (Butler and Berglund, 2012), moving beyond the current emphasis solely on economic value and towards the protection of non-protected landscapes. These implications extend to other water cities such as Kampong Ayer in Brunei (Azman et al., 2021) and Tohgli and Zhouzhuang in China (Porfyriou, 2019), where values in waterways are limited due to their current management trajectories, which parallels the situation in BUW.

8.3.3 Recognising challenges and engaging with the 'landscape approach'

The research findings clearly identify barriers, including the current reliance on a singular form of knowledge without considering alternative perspectives. These barriers directly contribute to ongoing environmental issues like floods and exacerbate social inequality by excluding water communities from decision-making processes. The thesis argues that addressing environmental challenges alongside societal vulnerability requires a landscape approach (Reed et al., 2016) involving stakeholders (Jansson et al., 2019) beyond traditional scientific expertise (Raymond et al., 2010). By taking a landscape approach, the thesis contends that resolving environmental issues could inherently lead to the mitigation of social challenges, creating a symbiotic

relationship among nature, society, and culture in Bangkok, rather than perceiving them separately.

Considering the logics of inaction (Dobson and Dempsey, 2021), the research advocates for a transformative shift in the conventional perceptions of the complexity or the impossibility of restoration efforts underpinning the notion of ecological landscapes. Heritage significance should not be bound by path dependency when devising protection strategies. This research recommends the adoption of a landscape approach to tackle these challenges, requiring an interdisciplinary, holistic scale, and multi-stakeholder approach (Sayer et al., 2013, Freeman et al., 2015).

To pursue a landscape approach in BUW management, adaptive co-management is recommended to foster flexibility and adaptation through multi-stakeholders collaboration (Armitage et al., 2008). This approach aims at integrating, exchanging (Fazey et al.,2012), and constructing knowledge (Lele et al., 2023). For instance, water heritage concepts can be integrated into BUW management through the collaboration of various stakeholders: agencies concerned with preservation efforts such as RC-ONEP, agencies involved in flood mitigation efforts such as DSD, multiple experts in areas such as preservationists, archaeologists, and water engineers, and locals who live around historical BUW.

The complexities (and perceived impossibilities) could be eased through such collaborative efforts, extending beyond collective decision-making processes to embrace a methodological approach to decision-making (Choo, 2002), as demonstrated through the workshops in this research. This approach can help achieve shared common ground (Lecuyera et al., 2018) and a shared vision, promoting the holistic approach to the intricate BUW management evidenced throughout this research. These implications can significantly contribute to other developing countries in Southeast Asia, such as Indonesia and Vietnam, where a business-as-usual approach and predominant centralisation in decision-making often leave marginalised stakeholders behind (Phi et al., 2015, Colven, 2023).

8.4 Recommendation of components in studying urban landscape

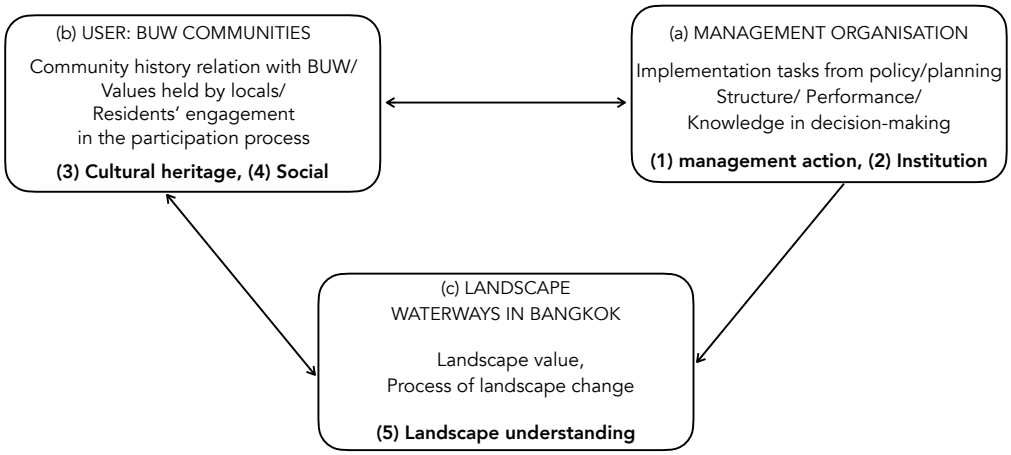


Fig 8-1 BUW's findings through user-landscape-management organisation model, adapted from (Jansson et al., 2019)

Following the model adopted from (Jansson et al., 2019) (Fig 8-1/Fig 3-2 Chapter 3), the research findings encompass; the implementation tasks from policies and planning, governance structure, performance, and knowledge in decision-making, which are explored under the management organisation involving BUW (a). Considering users of BUW, the community's historical relations with waterways, values held by locals, and resident engagement in the participation process are displayed (b). The process of BUW's landscape change and BUW's values are rigorously presented in this research (c).

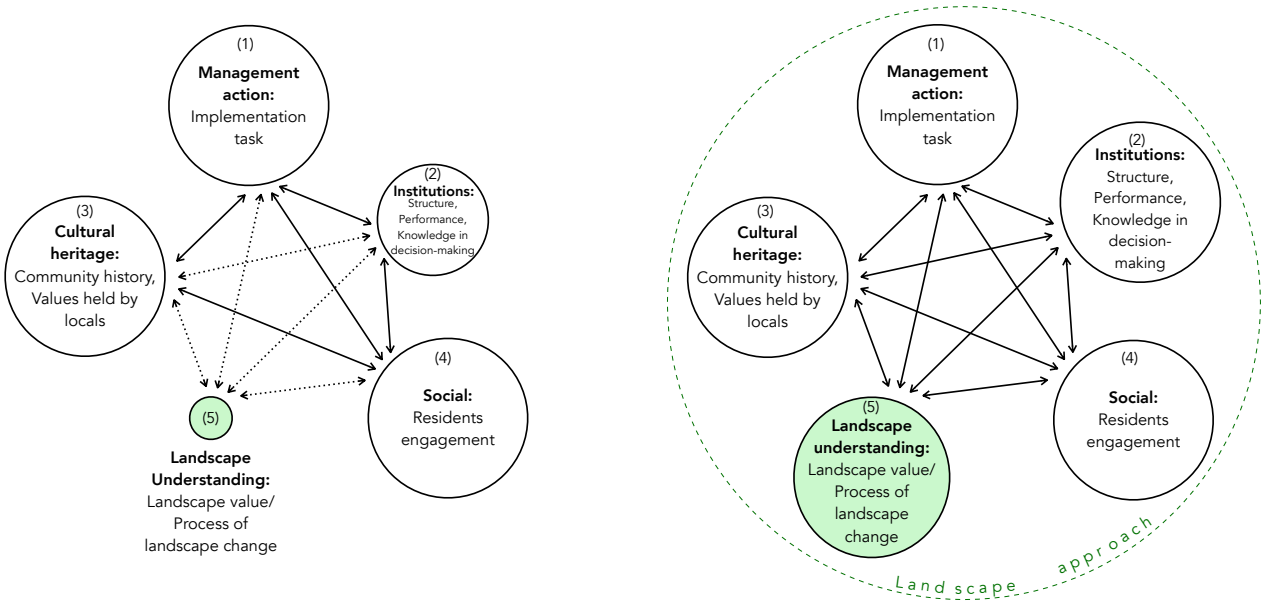


Fig 8-2 BUW's components relationship of thesis findings (Left), the recommendation (Right)

Five key components emerge from Figure 8-1: management action (1) and institution (2) relating to management organisation, cultural heritage (3) and social aspects (4) concerning BUW communities, and landscape understanding (5) pertaining to values and changes of BUW. These five components present their current connection, among others, in this research (Fig 8-2 Left).

Landscape understanding of BUW (5)—landscape values and process of change—shows fewer connections with the others, and similarly, understanding BUW itself holds little significance, as evidenced throughout the discussion (Section 7.3). While management action, social, and cultural heritage concerns (1)(4)(3) are prominent in Bangkok, none of them exhibit a strong link to the understanding of BUW as a landscape. Conversely, there is significant interaction among them (Section 7.2), i.e., management actions influence cultural heritage and social dimensions in the water communities.

Meanwhile, the institutional aspect of BUW (2)—its structure, performance, and knowledge in decision-making—receives less attention compared to cultural heritage, management action, and social aspects. This disparity is evident in the discussions (Sections 7.3 and 7.8), highlighting the necessity for institutional reform and critical decision-making processes. Moreover, there is a noticeable lack of connection to landscape understanding (5), which is considered crucial.

Hence, the recommendations stemming from these five components (Fig 8-2-Right) should be equally prioritised, emphasising their interconnectedness, with particular importance placed on the component of landscape understanding. Importantly, all five components are embedded through the adoption of the landscape approach (such as Sayer et al., 2013). This approach is highly recommended for studying interactions with change and value of the urban landscapes.

8.5 Contribution to changes in practice and policy

8.5.1 Transparent data sharing among different stakeholders

Data transparency is essential for both among government agencies (GA) and the public. Primarily, prioritising enhancing data acquisition and organisation is essential. Establishing a data-sharing platform holds a significant initial step. Such a platform would enable GA in transparently sharing and accessing data, streamlining exchange processes without cumbersome request. Simultaneously, agency data should be openly accessible to the public. Agency websites should provide up-to-date information and ensure ease of access to data. Information concerning proposed projects, particularly those relating to local communities or involving financial expenditures, should not be withheld. Equally critical is ensuring that data provided during public hearings and participation processes remains transparent and unhindered. Additionally, accessibility considerations should extend beyond digital formats, encompassing alternative outputs such as posters or audios, recognising that not everyone has access to computers or smartphones.

8.5.2 Collaboration among government agencies

To achieve critical communication and cooperation among GA, regulatory revisions should facilitate seamless collaboration among GAs. Each GA should an open-minded approach, prioritising the enhancement of integrated knowledge internally before engaging external facilitators. Initiatives could start with sharing information, reducing redundancy, and aligning tasks to achieve multiple objectives within their organisations.

For cooperation, the members or representatives of each agency should comprise effective working staff or committees. Additionally, these staffs or committees should bear the

accountability to ensure that tasks resulting from the discussions can effectively influence their respective departments. To ensure informed decision-making, extensive conversations involving different perspectives and discussions of advantages and drawbacks should typically occur, notably including multi-stakeholders- not just the GA.

If such a research project was funded by GA (or combination of GA), it could encompass a thorough examination of how its implementation could practically unfold rigorously. Such a process crucially relies on support from government leadership and clear fiscal and time parameters to mitigate agency concerns about its viability. Further exploration into institutional structure is warranted to delve deeper into institutional structures both within and among institutions. Specifically, future studies could seek comprehensive insights into their own institutional work through their organisational routines (Merkus et al., 2019), investigating how strategy, i.e., the collaboration among agencies, can be put into action.

8.5.3 Involvement of facilitators or third-party

The facilitators should include non-profit organisations, service-oriented entities, extra-local sectors, social enterprises focused on donations and charity rather than profit. It is important to note that politicians or political parties should not be considered as third parties in this context to ensure transparent and prevent ties to political interests. The third-party should possess the capability to engage with both private and public stakeholders to form partnerships, as presented in the waste and recycling sectors in London (Slater et al., 2007). This would need more investigation and further research in Bangkok's context.

The third party assumes a role that can be seen as more trustworthy and respected by the GA. They must be reliable in communicating with the GA and empowering locals, with a deep understanding of the BUW context or a willingness to invest time in gaining that understanding. Building trust between communities and the government should be a priority in this role. For instance, leveraging social learning (Collins and Ison, 2009) and fostering common agreements (Lecuyera et al., 2018) through facilitators should prioritise local community benefits over financial returns. This needs careful consideration within Bangkok's specific context.

8.5.4 Educational institution involvement

Educational institutions and professional organisations that can influence real-world practices should be involved in BUW management. Their involvement should enhance stakeholder engagements and knowledge exchanges. These institutions should be engaged during policy formulation to integrate knowledge right from the beginning.

Local residents may not always have the awareness or capability to anticipate situations or make critical decisions. Educational sectors could play a pivotal role in providing and enhancing accurate and rational knowledge to local communities and initiating the necessary changes for proposed project implementations. It is important that educational sectors proactively engage with the process, acting as volunteers rather than waiting for locals or GA to hire or request their assistance.

An illustration of future studio teaching in the Landscape Departments and Universities in Bangkok could involve stakeholders engaging in study activities aimed at facilitating the exchange of perspective or conversation between academics and GA.

8.5.5 Decentralisation and accountability in locals

This study emphasises the importance of granting accountability to the District Office (DIO), which is the agency most closely connected to the local community. This accountability is essential to empowering the DIO with the ability to negotiate rather than solely listening to directives from the BMA. The DIO needs to have a meaningful voice in the decision-making process. Consequently, support for 'overall community harmony' as discussed in Section 7.5, relies on the DIO facilitating the community's empowerment. While financial independence could be examined through local communities having control over budgets, which could ultimately empower them to make decisions independently, this needs further research on participatory budgeting in Bangkok's context.

The existing participation process in Thailand needs strengthened. Public participation should go beyond merely data collection and documenting it in research reports. A more critical approach is required, involving opportunities for residents to actively engage in discussions instead of merely listen to presentations. This dynamic promotes two-way communication rather than one-way transmission of information. Sufficient time should be allocated to these interactive communication processes. GA must conduct public engagement transparently and provide accurate information. To ensure relevance, GA should avoid prematurely finalising proposals or solutions. Instead, they should consider alternatives emerging from the participation process.

GA should initiate resident engagement at the beginning of project proposals, drawing from examples such as the Solomon Island, where local knowledge shape the project direction (Berkes et al., 2000), and employing 'problem-centric processes' for local engagement (Raymond et al., 2010). This approach has yet to be implemented in Thailand. Achieving this requires support from government leadership and regulations governing fiscal and project execution timelines.

8.5.6 Shared benefits and consent among stakeholders

Promoting shared benefits related to BUW could potential encourage 'land adjustment', a strategy involving the merging of properties and reconfiguration to create communal benefits among locals. This mechanism has been applied in historical zones where properties adjacent to the historical BUW frequently have fragmented deeds (GA-02/04/06). However, it implementation is limited and often prolonged due to the reluctance of property owners to relinquish their rights to the GA. Further research is needed to explore this in detail.

In challenging situations, GA must ensure that decisions consistently gain the consent of those affected individuals who may be willing to accept compromises if they have been fully involved in the decision-making process. Compensation should be a last resort, with an emphasis on an honest and transparent engagement process. The primary goal of this engagement should be to identify shared benefits among stakeholders, especially residents with deep local knowledge of

specific areas. Achieving shared benefits should be a prioritised across all BUW areas, regardless of their protected or non-protected status, because Bangkok's urban waterways form an integral part of Bangkok's valued landscapes.

8.6 Conducting future research

According to the reflection that fieldworks is time consuming in terms of GA recruitment, future research should secure sponsorship from significant government entities, including ministries, national research institutions, or reputable NGOs to get project buy-in. Collaboration with such esteemed organisations can streamline participant recruitment processes and enhance the credibility and legitimacy of the research undertaking, including help ensure financial support.

Partnering with government bodies and respected institutions also can provide access to valuable resources, networks, and expertise, thereby enriching the research process and outcomes. This is crucial for overcoming limitations related to restricted data access from GA, as reflected in methodology chapter.

Moreover, the secure sponsorship from respected institutions also could help overcome the limitation of the researcher's positionality including this PhD's problems with recruitment because the individuals associated with network of GAs would be more likely to be formally aligned with the research's objectives and willing to participate.

In relation to the constraints in recruiting members of the local communities, future research could expand its scope to include a wider number and broader context of study sites along the waterways, representing different social structures and site characteristics. Further exploration of the practical implementation process, which has yet to be rigorously presented in this research, is therefore required. It is imperative to explore ongoing management practices or project executions by identifying more sites demonstrating different phases of project implementation.

Due to time constraints in the research process, this thesis had to conclude data collection after a certain point. Future research could explore additional avenues by engaging residents, further analysing how locals respond to scenarios presented by experts, which could yield valuable and fascinating insights. Furthermore, the research materials could also be developed further to stimulate discussions in similar contexts of waterway management beyond Bangkok.

References

Aboutorabi, M. 2018. Culture, Space, and Place: An inquiry into the Urban Landscape of Multicultural Cities. *Journal of Engineering and Architecture,* 6**,** 7-19.

Adams, W. C. 2010. Conducting semi-structured interviews. *In:* Wholey, J. S., Hatry, H. P. & Newcomer, K. E. (eds.) *Handbook of Practical Program Evaluation*. Jossey-Bass.

Akyildiz, S. T. m. & Ahmed, K. H. 2021. An Overview of Qualitative Research and Focus Group Discussion. *International Journal of Academic Research in Education,* 7.

Alexander, E. R. & Faludi, A. 1989. Planning and plan implementation: notes on evaluation criteria. *Environment and Planning B: Planning and Design,* 16**,** 127-140.

Angel, S., Parent, J. & Civco, D. 2007. Urban sprawl metrics: An analysis of global urban expansion using GIS. *ASPRS 2007 Annual Conference*. Tampa, Florida.

Antrop, M. 2005. Why landscape of the past are important for the future. *Landscape and Urban Planning,* 70**,** 21-34.

AON 2012. 2011 Thailand Floods Event Recap Report Impact Forecasting, March 2012. AON Corporation Benefield ed. 200 East Randolph Street Chicago: Impact Forecasting LLC.

AQR 1980. The association for qualitative research: the hub of qualitative thinking. The internationally recognised Hub of Qualitative Thinking.

Armitage, D. R., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., Diduck, A. P., Doubleday, N. C., Johnson, D. S., Marschke, M., McConney, P., Pinkerton, E. W. & Wollenberg, E. K. 2008. Adaptive co-management for social– ecological complexity. *Front Ecol Environ,* 7**,** 95–102.

Arnstein, S. R. 1969. A Ladder Of Citizen Participation. *Journal of the American Institute of Planners (JAPA),* 35**,** 216-224.

Aruninta, A. 2009. Rehabilitative Landscape in the Old Communities in Bangkok, Thailand. *The 2009 Incheon IFLA APR Congress*. Incheon, Korea: IFLA APR

Aruninta, A. 2013. The Meaning and Spirit of Living with Water Cultural Landscape in Flood Protection Model : The Case of the Chaophraya River Basin and the Delta of Central Thailand. *ACLA symposium proceeding*. Seoul National University.

Aruninta, A., Matsushima, H. & Phukumchai, P. 2020. Flow or Fence: Learning, Preserving, and Redefining the Riverfront Cultural Landscape. *Journal of Water Resource and Protection,* 2**,** 921-933.

Askew, M. 1993. The Banglamphu District: A Portrait of Change in Inner Bangkok. *The 1993 Year-End Conference: Who gets what and how?: Challenges for the future:* . Jomtien Chonburi, Thailand.

Askew, M. 1996. The Rise of "Moradok" and the Decline of the "Yarn": Heritage and Cultural Construction in Urban Thailand. *Sojourn: Journal of Social Issues in Southeast Asia,* 11.

Askew, M. 2002. *Bangkok Place, practice and representation,* London EC4P 4EE, Routledge, Taylor & Francis Group.

Ausawasakunruecha, L. & Pinyo, K. 2019. Khlong Banglampoo: From moat to the cultural symbol of the community. Banglamphu Museum by the treasury Department.

Azman, N. A. H., Shukri, S. M. & Bachek, S. H. 2021. The City on Stilts: A historic settlement in the heart of Brunei Capital City. *Malaysia Architectural Journal,* 3**,** 18-22.

Baker, W. L. 1989. A review of models of landscape change. *Landscape Ecology,* 2**,** 111-133.

Baldassarre, G. D. 2012. *Floods in a Changing Climate : Inundation Modelling*, Cambridge University Press.

BangkokGIS 2019. The urban vulnerable flood point in Bangkok. Geo-Informatics Center of Bangkok.

Barry, A. 2012. Political situations: knowledge controversies in transnational governance. *Critical Policy Studies,* 6**,** 324–336.

Bell, D. E., Keeney, R. L. & Raiffa, H. 1977. *Conflicting Objectives in Decisions,* Chichester, New York, Brisbane, Toronto, International Institute for Applied Systems Analysis.
Berkes, F. 2004. Rethinking Community-Based Conservation. *Conservation Biology,* 18**,** 621-630.
Berkes, F. 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management,* 90**,** 1692–1702.
Berkes, F., Colding, J. & Folke, C. 2000. Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications,* 10**,** 1251-1262.
Blaikie, N. 2007. *Approaches to Social Enquiry: Advancing Knowledge*, Polity Press.
BMA 2017. Bangkok Resilience Strategy. *In:* Cities, R. (ed.). Thailand: The Rockefeller Foundation.
BMA 2019. (Draft) The 4th revision of the Comprehensive Land-use Plan of Bangkok: The presentation documents for public hearing. Department of city planning and urban development.
Boonlert, T. 2021. *Giving new life to canals* [Online]. Bangkok, Thailand: Bangkok Post PCL. Available: link:https://www.bangkokpost.com/life/social-and-lifestyle/2207371/giving-new-life-to-canals. [Accessed 10 August 2022].
Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology,* 3**,** 77-101.
Braun, V. & Clarke, V. 2020. One size fits all? What counts as quality practice in (reflexive) thematic analysis? . *Qualitative Research in Psychology*
Broadhurst, K. E. A. 2017. *Understanding Canals in Bangkok Using Historic Maps and GIS*. Degree of Master of Liberal Arts in Extension Studies, Harvard University.
Bruaset, S. & Saegrov, S. 2018. Using the multiple scenario approach for envisioning plausible futures in long-term planning and management of the urban water pipe systems. *European Journal of Futures Research,* 6.
Brummelhuis, H. T. 2005. *King of the waters: Homan van der Heide and the origin of modern irrigation in Siam,* The Netherlands, Koninklijk Instituut voor Taal-, Land- en Volkenkunde.
Bryman, A. 2016. *Scial Research Methods,* United States of America, Oxford University Press.
Bürgi, M., Hersperger, A. M. & Schneeberger, N. 2004. Driving forces of landscape change – current and new directions. *Landscape Ecology,* 19.
Bürgi, M. & Russell, E. W. B. 2001. Integrative methods to study landscape changes. *Land Use Policy,* 18**,** 9-16.
Burr, V. 2015. *Social Constructionism*, Routledge Taylor & Francis Group.
Butler, A. 2016. Dynamics of integrating landscape values in landscape character assessment: the hidden dominance of the objective outsider. *Landscape Research,* 41**,** 239-252.
Butler, A. & Berglund, U. 2012. Landscape Character Assessment as an Approach to Understanding Public Interests within the European Landscape Convention. *Landscape Research,* 39**,** 219-236.
Byrne, D. 2022. A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality & Quantity,* 56**,** 1391–1412.
Carpiano, R. M. 2009. Come take a walk with me The Go Along interview as a novel method for studying the implications of place for health and well-being. *Health&Place,* 15**,** 263-272.
Casper, B. 2015. Amphibian Identity? Waterspatial Resilience of Khlong in Bangkok. *Nakhara: Journal of Environmental Design and Planning***,** 61-76.
Cengiz, B. l. 2013. Urban River Landscapes. *Advances in Landscape Architecture*. Intech
Chan, F. K. S., Friess, D. A., Terry, J. P. & Mitchell, G. 2015. Impact of climate change, Challenges of flooding in coastal East Asia. *In:* Harris, P. G. & Lang, G. (eds.) *Routledge Handbook of Environment and Society in Asia*. London and New York Routledge Taylor& Francis Group.

Chansiri, N. 1999. *The Historic Canal System in Bangkok, Thailand: Guidelines for Reestablishing Public Space Functions*. Master of Landscape Architecture, Polytechnic Institute and State University.

Chaumpol, M. 2003. Owner of Thailand's first "land title deed" with the starting point for new mapping and title deeds. *Silapa Wattanatum,* January

Choo, C. W. 2002. Sensemaking, Knowledge Creation, and Decision Making: Organizational Knowing as Emergent Strategy. *In:* Choo, C. W. & Bontis, N. (eds.) *The Strategic Management of Intellectual Capital and Organizational Knowledge*. New York: Oxford University Press.

Collins, H. 2014. Rejecting knowledge claims inside and outside science. *Social Studies of Science,* 44**,** 722–735.

Collins, K. & Ison, R. 2009. Jumping off Arnstein's Ladder: Social Learning as a New Policy Paradigm for Climate Change Adaptation. *Environmental Policy and Governance,* 19**,** 358-373.

Colven, E. 2023. A political ecology of speculative urbanism: The role of financial and environmental speculation in Jakarta's water crisis. *Economy and Space,* 55**,** 490-510.

CU, A. 2016. *The Urban Conservation Plan for the Banglamphu Canal Cultural Heritage Corridor,* Bangkok, Thailand, Department of Architecture, Chulalongkorn University.

Dahiya, B. & Thaitakoo, D. 2011. Why indigenous knowledge can help climate change adaptation. *Urban World,* 5.

Daisi, Y. 2012. *Sustainable development of (UNESCO) heritage sites in China and the Netherlands, Case studies of Lijiang, China and Amsterdam, the Netherlands*. Master Degree, Wageningen University.

Davivongs, V. & Arifwidodo, S. 2020. Bangkok Inner Orchard's Landscape: The Interpretation form Old Maps and Photographs. *NAjao,* 2**,** 249-327.

Davivongs, V., Yokohari, M. & Hara, Y. 2012. Neglected Canals: Deterioration of Indigenous Irrigation System by Urbanization in the West Peri-Urban Area of Bangkok Metropolitan Region. *Water,* 4**,** 12-27.

Deewattanakul, P. 2016. Bangkok Metropolitan Model in the New Decade. *Journal of the Association of Researchers (Samakom Nakwijai),* 21.

Dempsey, N., Jayaraj, S. R. & Redmond, E. 2017. There's always the river: social and environmental equity in rapidly urbanising landscapes in India. *Landsacpe Research,* 43**,** 275-288.

Dempsey, N., Smith, Burton, H. & Mel 2014. *Place-keeping : open space management in practice,* New York ; London, Routledge, Taylor & Francis Group.

Dempsey, N., Velarde, C. L. M., Samuel, M., Bakshi, Y. & Baradi, M. 2020. From river to Riverfront: how meanings and cultural heritage change. The case of the Sabarmati Riverfront project, Ahmedabad, Gujarat. *Town Planning Review,* 91**,** 643-666.

Denevan, W. M. & Mathewson, K. 2009. *Carl Sauer on Cultural and Landscape: Readings and Commentaries,* the United States of America, Louisiana State University Press.

Desmet, K., Kopp, R. E., Kulp, S. A., Nagy, D. K., Oppenheimer, M., Rossi-Hansberg, E. & Strauss, B. H. 2021. Evaluating the Economic Cost of Coastal Flooding. *American Economic Journal: Macroeconomics***,** 444-486.

Dinka, D. & Lundberg, J. 2006. Identity and role—A qualitative case study of cooperative scenario building *Human-Computer Studies* 64**,** 1049-1060.

Divay, G. & Wolfe, J. M. 2002. *Metropolitan Governance Background Study: What do we need to know? A Rapid foray into operational concerns,* Durocher Montréal, Institut national de la recherche scientifique.

Dobson, J. & Dempsey, N. 2021. Known but not done: how logics of inaction limit the benefits of urban green spaces. *Landscape Research,* 46**,** 390-402.

Doherty, G. & Waldheim, C. 2016. *Is Landscape...? Essays on the Identity of Landscape,* New York, Routledge.
Donaldson, A., Lane, S., Ward, N. & Whatmore, S. 2013. Overflowing with issues: following the political trajectories of flooding. *Environment and Planning C: Government and Policy,* 31**,** 603 – 618.
DSD 2007. Annual Report of flooding protection and prevention plan. *In:* Sewage, D. (ed.). Bangkok, Thailand: Bangkok Metropolitan Administrator.
DSD 2011. Annual Report of flooding protection and prevention plan. *In:* Department, D. S. (ed.). Bangkok, Thailand: Bangkok Metropolitan Administrator.
DSD 2012. Annual Report of flooding protection and prevention plan. *In:* Department, D. S. (ed.). Bangkok, Thailand: Bangkok Metropolitan Administrator.
DSD. 2015. *History of Drainage and Sewerage Department* [Online]. Thailand. Available: https://dds.bangkok.go.th/about2.php [Accessed August 2023].
DSD 2020a. Annual Report of flooding protection and prevention plan. *In:* Department, D. S. (ed.). Bangkok, Thailand: Bangkok Metropolitan Administrator.
DSD 2020b. Construction of water treatment plants in Minburi area. *In:* Department, D. S. (ed.). Bangkok. Thailand: Bangkok Metropolitan Administrator.
Duangporn Nopkhun, S. T. 1982. *Canals in Bangkok: History Changes and Their Impact,* Bangkok, Thailand, Chulalongkorn university printing house.
Duangyiwa, C., Yu, D., Wilby, R. L. & Aobpaet, A. 2015. Coastal Flood Risks in the Bangkok Metropolitan Region, Thailand: Combined Impacts of Land Subsidence, Sea Level Rise and Storm Surg. Loughborough University.
Dunham, J. B., Angermeier, P. L., Crausbay, S. D., Cravens, A. E., Gosnell, H., McEvoy, J., Moritz, M. A., Raheem, N. & Sanford, T. 2018. Rivers are social-ecological systems: Time to integrate human dimensions into riverscape ecology and management. *WIREs Water***,** 1-10.
Edinger, L. 1975. The Comparative Analysis of Political Leadership. *Comparative Politics,* January**,** 69-253.
Ehrlich, P. R. & Mooney, H. A. 1983. Extinction, Substitution, and Ecosystem Services. *BioScience,* 33**,** 248-254.
Elliott, K. 2011. Direct and Indirect Roles for Values in Science. *Philosophy of Science Association,* 78**,** 303-324.
Esri. 2021. *Global land use/land cover with Sentinel-2 and deep learning*. Esri, Impact Observatory, and Microsoft.
Everard, M. & Moggridge, H. L. 2011. Rediscovering the value of urban rivers. *Urban Ecosyst,* 15**,** 293-314.
FAD 2017. *Mirror film archives of one thousand pictures: History of Rattanakosin,* Thailand, Thailand National Archive, Fine Art Department.
Faria, R. & Petintseva, O. 2021. Researching powerful elites & researching powerful subalterns. *SCJ/CDD Researching Powerful Elites & Researching Vulnerable Subalterns*. June 11 ed.: White Rose Social Science Doctoral Training Partnership WRDTP.
Fazey, I., Bunse, L., Msika, J., Pinke, M., Preedy, K., Evely, A. C., Lambert, E., Hastings, E., Morris, S. & Reed, M. S. 2014. Evaluating knowledge exchange in interdisciplinary and multi-stakeholder research. *Global Environmental Change,* 25**,** 204-220.
Fazey, I., Evely, A. C., Reed, M. S., Stringer, L. C., Kruijsen, J., White, P. C. L., Newsham, A., Jin, L., Cortazzi, M., Phillipson, J., Blackstock, K., Entwistle, N., Sheate, W., Armstrong, F., Blackmore, C., Fazey, J., Ingram, J., Gregson, J., Lowe, P., Morton, S. & Trevitt, C. 2012. Knowledge exchange: a review and research agenda for environmental management. *Environmental Conservation,* 40**,** 19-36.

Felstead, A. & Thwaites, K. 2023. A grounded pattern language: testing a methodology for exploring cohousing residents' involvement in shared outdoor spaces. *CoDesign, International Journal of CoCreation in Design and the Arts*.

Folke, C. 2004. Traditional Knowledge in Social–Ecological Systems. *Ecology and Society,* 9.

Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T. & Rockström, J. 2010. Thinking: Integrating Resilience, Adaptability and Transformability. *Ecology and Society,* 15.

Folke, C., Hahn, T., Olsson, P. & Norberg, a. J. 2005. Adaptive governance for Social-Ecological System. *Annu. Rev. Environ. Resour.,* 30**,** 41-73.

Forman, R. T. 2008. *Urban Regions: Ecology and Planning Beyond the City,* United States of America, Cambridge University Press.

Forman, R. T. T. 1995. *Land Mosaics: The ecology of landscapes and regions* United Kingdom, The Press Syndicate of the University of Cambridge.

Frantzeskaki, N., Wijsman, K., Adams, C., Kabisch, N., Malekpour, S., Pinto, M. P. & Vandergert, P. 2023. Governance of and with nature-based solutions in cities. *In:* McPhearson, T., Kabisch, N. & Frantzeskaki, N. (eds.) *Nature-Based Solutions for Cities*. Edward Elgar Publishing Limited.

Freeman, O. E., Duguma, L. A. & Minang, P. A. 2015. Operationalizing the integrated landscape approach in practice. *Ecology and Society,* 20.

Gajaseni, S. 1998. *Reconsidering the Roles for Urban Waterways: Opportunities for Khlong Rop Krung*. Degree of Master In City Planning, Massachusetts Institute of Technology.

Galbin, A. 2014. An introduction to social constructionism. *Social Research Reports,* 26**,** 82-92.

Gale, E. L. & Saunders, M. A. 2013. The 2011 Thailand flood: climate causes and return periods. *Weather* 68**,** 233-237.

GHS 2018. Global Human Settlement built-up grid, derived from Landsat, multitemporal *In:* Commission, E. (ed.) *R2018A*. Joint Research Centre (JRC): Corbane, Christina; Florczyk, Aneta; Pesaresi, Martino; Politis, Panagiotis; Syrris, Vasileios.

GISDA. 2020. *Thailand Flooding Monitoring System 2005-2020*. Thailand: Geo-Informatics and Space Technology Development Agency.

Görg, C. 2007. Landscape governance: The "politics of scale" and the "natural" conditions of places. *Geoforum,* 38**,** 954-966.

Graebner, M. E., Martin, J. A. & Roundy, P. T. 2012. Qualitative data: Cooking without a recipe. *Strategic Organization,* 10**,** 276-284.

Gray, S., Chanb, A., Clarkb, D. & Jordanb, R. 2012. Modeling the integration of stakeholder knowledge in social–ecological decision-making: Benefits and limitations to knowledge diversity. *Ecological Modelling,* 229**,** 88-96.

Guest, G., MacQueen, K. M. & Namey, E. E. 2012. *Applied Thematic Analysis,* the United Kingdom, SAGE Publications, Inc.

Hanna, K., Maijia, P. A., Martin, J. & Mari, K. 2016. Systematic methodological review : developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing,*.

Harrison, R. 2013. Forgetting to remember, remembering to forget: late modern heritage practices, sustainability and the 'crisis' of accumulation of the past. *International Journal of Heritage Studies,* 19**,** 579-595.

Hassan, N. H. & Yong, G. Y. V. 2019. The Cultural Value of Bakuts in Kampong Ayer, Brunei Darussalam. *Southeast Asia: A Multidisciplinary Journal,* 19**,** 47-63.

Hays, P. A. 2004. Case Study Research. *In:* Silverman, N. (ed.) *Foundations for Research Methods of Inquiry in Education and the Social Sciences*. London: Lawrence Erlbaum Associates.

Healey, P. 2006 *Collaborative Planning : Shaping Places in Fragmented Societies,* Basingstoke, Hampshire, New York, Palgrave Macmillan.

Hein, C., Schaik, H. v., Six, D., Mager, T., Kolen, J. J. C. A., Ertsen, M., Nijhuis, S. & Verschuure-Stuip, G. 2020. Introduction: Connecting Water and Heritage for the Future. *Adaptive Strategies for Water Heritage Past, Present and Future*. Springer Open.

Herbeck, J. & Zoysa, R. S.-d. 2022. Transformations of Urban Coastal Nature(s): Meanings and Paradoxes of Nature-Based Solutions for Climate Adaptation in Southeast Asia. *In:* Vigl, L. E. (ed.) *Human-Nature Interactions: Exploring Nature's Values Across Landscapes*. Switzerland: Springer

Herk, S. V., Zevenbergen, C., Rijke, J. & Ashley, R. 2011. Collaborative research to support transition towards integrating flood risk management in urban development. *Journal of Flood Risk Management, The Chartered Institution of Water and Environmental Management*.

Holling, C. S. 1973. Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics,* 4**,** 1-23.

Holthuijsen, S. R. & Ouboter, M. R. L. 2021. Amsterdam and the City Swim (ACS). Available: https://www.wereldwaternet.nl/contentassets/6878882b104d4fac8fd131a367e203d6/full-paper-4714541---saskia-holthuijsen.pdf.

Hoppe, R., Wesselink, A. & Cairns, R. 2017. Lost in the problem: the role of boundary organisations in the governance of climate change. *Wiley interdisciplinary reviews: Climate Change*.

Hossain, M. & Iamtrakul, P. 2007. Water Transportation in Bangkok: Past, Present, and the Future. *Journal of Architectural/Planning Research and Studies,* 5**,** 3-23.

Hungspreug, S., Khaouppatum, W. & Thanopanuwat, S. 2000. Flood management in Chao Phraya River basin. *The Chao Phraya Delta: Historical Development, Dynamics and Challenges of Thailand' Rice Bowl*.

Hunter, M. 2022. Water infrastructural heritage: management and governance. *Infrastructure Asset Management,* 9**,** 170-179.

Iamtrakul, P., Klaylee, J. & Srivanit, M. 2018. Resilience in Urban Transport Towards Hybrid Canal-Rail Connectivity Linking Bangkok's Canal Networks to Mass Rapid Transit Lines. *BUILT,* 10**,** 28-41.

Innes, J. E. & Booher, D. E. 1999. Metropolitan Development as a Complex System: A New Approach to Sustainability. *Economic Development Quarterly,* 13**,** 141-156.

Innes, J. E. & Booher, D. E. 2003. Collaborative policymaking: governance through dialogue. *In:* Hajer, M. A. & Wagenaar, H. (eds.) *Deliberative Policy Analysis Understanding Governance in the Network Society*. Cambridge University Press.

Issarathumnoon, W. 2006. The Implementation of Conservation Plans of the Rattanakosin Area, Bangkok. *The 12th International Planning History Conference*. New Delhi, India.

Issarathumnoon, W. 2016. *The Urban Conservation Plan for the Banglamphu Canal Cultural Heritage Corridor,* Bangkok, Thailand, Department of Architecture Chulalongkorn University.

Issarathumnoon, W. 2020. Applying the Historic Urban Landscape Approach to the Identification of Urban Heritage Attributes of Bangkok's Old Town. *Nakhara: Journal of Environmental Design and Planning,* 19.

IUCN. 2021. *Climate justice for people and nature through urban Ecosystem-based Adaptation (EbA)* [Online]. IUCN. Available: https://www.iucn.org/our-work/nature-based-solutions [Accessed 3 October 2023].

Jansson, M., Vogel, N., Fors, H. & Randrup, T. B. 2019. The governance of landscape management: new approaches to urban open space development. *Landscape Research,* 44**,** 952-965.

Jarupongsakul, T. & Kaida, Y. 2019. The Imagescape of the Chao Phraya delta into the year 2020. *Sarasart*.

Jha, A. K., Bloch, R. & Lamond, J. 2012. *Cities and Flooding: A guide to integrated urban flood risk management for the 21st Century,* Washington, D.C., The World Bank, GFDRR

Jiarakul, D. 2015. *Khlong: Bangkok Canals Revitalization*. Doctor of Philosophy Program, Graduate School, Silpakorn University.

Jiarakul, D. 2016. Khlong: Bangkok canals revitalization. *Veridian E-Journal,* 9.

JICA 2013. Project for the conprehensive flood management plan for The Chaophraya River Basin. *In:* Report, S. (ed.). Kingdom of Thailand: NESDB, RID, MOAC, DWR, MNRE.

Jiraprasertkun, C. 2015. Thai Conceptualizations of Space, Place and Landscape. *In:* Bruns, D., Schönwald, A., Kühne, O. & Theile, S. (eds.) *Landscape Culture- Culturing Landscapes The Differentiated Construction of Landscapes*. Germany: Springer Fachmedien Wiesbaden.

John, P. & Cole, A. 1999. Political Leadership in the New Urban Governance: Britain and France Compared. *Local Government Studies,* 25**,** 98-115.

Jonanan, S. 2000. The Governance Strucuture of Bangkok. Funeral Memorial Book Acting Second Lieutenant Samerjai Phumpuang BMA information center.

Jones, A. 1997. Urban conservation issues in Brunei Darussalam: the case of Brunei's water villages. *Planning Perspectives,* 12**,** 457-475.

Jular, P. 2017. The 2011 Thailand Floods in The Lower Chao Phraya River Basin in Bangkok Metropolis. *In:* Gunya, K. J., Brikke, F. n. & Lu, S. (eds.). Global Water Partnership.

Kendle, T. & Forbes, S. 1997. *Urban Nature Conservation,* London, the United Kingdom, E&FN Spon.

Khamchiangta, D. & Dhakal, S. 2020. Time series analysis of land use and land cover changes related to urban heat island intensity: Case of Bangkok Metropolitan Area in Thailand. *Journal of Urban Management,* 9 383-395.

Khunthong, S. & Sukolratanametee, S. 2020. Relationships Between The Use of Ong-Ang Canal Promenade and Its Surrounding Neighborhoods. *Thai Journal Online (ThaiJO),* 70**,** 17-36.

Kitzinger, J. 1995. Qualitative Research: Introducing focus groups. *BMJ,* 311**,** 299-302.

Klamsom, P. 2008. Dek Banpantom. *Muang Boran Journal,* 1.

Komori, D., Kiguchi, M., Nakamura, S. & Nishijima, A. 2012. Characteristics of the 2011 Chao Phraya River flood in Central Thailand. *Hydrological Research Letters,* 6**,** 41-46.

Kuhn, T. S. 1962. *The Structure of Scientific Revolutions,* the United States of America, The University of Chicago.

Kunti 2014. *Pum Tamnan Kang Rabainam (History of drainage in Thailand),* Bangkok, Thailand, Drainage Department.

Kvale, S. 2011. Ethical Issues of Interviewing in Doing Interviews. *SAGE Research Methods***,** 24-32.

Laeni, N., Brink, M. v. d. & Arts, J. 2019. Is Bangkok becoming more resilient to flooding A framing analysis of Bangkok flood resilience policy combining insights from both insiders and outsiders. *Cities,* 90 157-167.

Laquian, A. A. 2011. The Planning and Governance of Asia's Mega-Urban Regions. *Population Distribution, Urbanization, Internak Migration and Development: An International Perspective*. United Nations publication.

Lebel, L. & Lebel, P. 2018. Policy narratives help maintain institutional traps in the governance of floods in Thailand. *International Journal of Water Resources Development,* 34**,** 616-631.

Lecuyera, L., Whiteb, R. M., Schmookc, B. & Calméa, S. 2018. Building on common ground to address biodiversity conflicts and foster collaboration in environmental management. *Journal of Environmental Management,* 220**,** 217–226.

Lele, S., Bene, D. D., Avcı, D., Roa-Avendaño, T., Roy, B., Sahu, G., Harris, M. & Moore, D. 2023. Values and knowledges in decision-making on environmentally disruptive infrastructure projects: insights from large dams and mines. *Current Opinion in Environmental Sustainability,* 64.

Lempert, R., Kalra, N., Peyraud, S., Mao, Z., Tan, S. B., Cira, D. & Lotsch, A. 2013. Ensuring Robust Flood Risk Management in Ho Chi Minh City. *Policy Research Working Paper*.

LePoer, B. L. 1989. *Thailand a country study,* Federal Research Division Library of Congress: Washington, D.C., U.S. Government Printing Office

Liu, S. & Shu, H. 2020. Sustainable cultural tourism & heritage conservation in China, case studies of the ancient waterfront towns in the south of the Yangtze River. *In:* Syngellakis, S. & Hernandez, S. (eds.) *Eleventh international conference on sustainable development and planning & second international conference on urban growth and the cultural economy 2020*. WITpress.

Loschner, L., Nordbeck, R., Scherhaufer, P. & Seher, W. 2016. Scientist–stakeholder workshops: A collaborative approach for integrating science and decision-making in Austrian flood-prone municipalities. *Environmental Science & Policy,* 55**,** 345-352.

Malatesta, S. 2013. Floodscape? A reading of space-making and place-making process in regions affected by flood hazard. *The Geographical Review,* 103**,** 537-555.

Manzini, I., Koopmans, B. & Noordegraaf, J. J. 2022. The pilot 'Living with water in Amsterdam' as proof of concept of the Amsterdam Time Machine approach. Amsterdam University of Applied Sciences.

Marks, D. 2015. The Urban Political Ecology of the 2011 Floods in Bangkok: The Creation of Uneven Vulnerabilities. *Pacific Affairs,* 88**,** 623-650.

Marks, D. 2016. It is Built Against Nature: Floodwalls Built After the 2011 Floods in Central Thailand. *Improving Flood Management in Thailand*. Printed in Thailand: International Development Research Centre (IDRC).

Marks, D. 2020. The Political Ecology of Climate Injustice in Bangkok. *In:* Gregory, B., Rabe, P., Parthasarathy, R., Sami, N. & Zhang, B. (eds.) *Future Challenges of Cities in Asia*. Amsterdam: Amsterdam University Press.

Marks, D., Connell, J. & Ferrara, F. 2020. Contested notions of disaster justice during the 2011 Bangkok floods: Unequal risk, unrest and claims to the city. *Asia Pacific Viewpoint,* 61**,** 19-36.

Marks, D. & Lebel, L. 2016. Disaster governance and the scalar politics of incomplete decentralization: Fragmented and contested responses to the 2011 floods in Central Thailand. *Habitat International,* 52.

Marshall, R. 2001. *Waterfronts in Post-industrial Cities,* London, the Taylor & Francis.

Martine, G. 2011. Preparing for sustainable urban growth in developed areas. *Population Distribution, Urbanization, Internal Migration and Development: An International Perspective*. United Nations publication.

McGonigle, D. F., Nodari, G. R., Phillips, R. L., Aynekulu, E., Estrada-Carmona, N., Jones, S. K., Koziell, I., Luedeling, E., Remans, R., Shepherd, K., Wiberg, D., Whitney, C. & Zhang8, W. 2020. A Knowledge Brokering Framework for Integrated Landscape Management. *Frontiers in Sustainable Flood Systems,* 4.

McGrath, B., Tachakitkachorn, T. & Thaitakoo, D. 2015. Bangkok's Distributary Waterscape Urbanism: From a Tributary to Distributary System. *Water Urbanism East, Emerging Practices and Age-old Traditions*. Park Books: UFO Explorations of Urbanism.

McGrath, B. & Thaitakoo, D. 2005. Tasting the Periphery: Bangkok's Agri- and Aquacultural Fringe. *Architectural Design: Food and the city,* 5**,** 43-51.

McHarg, I. L. 1995. *Design with Nature*, John Wiley & Sons Inc.

McPhearson, T., Kabisch, N. & Frantzeskaki, N. 2022. Nature-based solutions for sustainable, resilient, and equitable cities *Nature-Based Solutions for Cities*. Cheltenham, UK, Northampton, MA, USA: Edward Elgar Publishing Limited.

McPhillips, L., Wu, H., Quezada, C. R., Rosenzweig, B., Sauer, J. R. & Winfrey, B. 2022. Nature-based solutions as critical urban infrastructure for water resilience. *In:* McPhearson, T.

(ed.) *Nature-based solutions for sustainable, resilient, and equitable cities* Cheltenham, UK, Northampton, MA, USA: Edward Elgar Publishing Limited.
Meehan, B. 2021. Conducting Reflexive Thematic Analysis using Nvivo. Available from: https://www.youtube.com/watch?v=YPeMxd0bySU&t=275s [Accessed 16 Febuary 2021].
Merkus, S., Willems, T. & Veenswijk, M. 2019. Strategy Implementation as Performative Practice: Reshaping Organization into Alignment with Strategy. *Organization Management Journal,* 16**,** 140-155.
Milder, J. C., Hart, A. K., Dobie, P., Minai, J. & Zaleski, C. 2014. Integrated Landscape Initiatives for African Agriculture, Development, and Conservation: A Region-Wide Assessment. *World Development,* 54**,** 68-80.
Misiune, I. & Depellegrin, D. 2022. *Human-Nature Interactions: Exploring Nature's Values Across Landscapes,* Switzerland, Springer
Mitchell, N., Rössler, M. & Tricaud, P.-M. 2009. World Heritage Cultural Landscapes: A Handbook for Conservation and Management. *World Heritage Papers,* 26.
Molle, F. 2007. Scales and power in river basin management: the Chao Phraya River in Thailand. *The Geographical Journal,* 173**,** 358-373.
Moniz, A. B. 2005. Methods for Scenario-building: it's importance for policy analysis *ResearchGate*.
Mulhall, A. 2002. In the field: notes on observation in qualitative research. *Journal of Advanced Nursing* 41**,** 306-313.
Munaretto, S., Vellinga, P. & Tobi, H. 2012. Flood Protection in Venice under Conditions of Sea-Level Rise: An Analysis of Institutional and Technical Measures. *Coastal Management,* 40**,** 335-380.
Nair, S., Wen, W. K. & Ling, C. M. 2014. Bangkok Flood Risk Management: Application of Foresight Methodology for Scenario and Policy Development. *Journal of Futures Studies,* 19**,** 87-112.
Nantavisai, M. & Thaitakoo, D. 2023. The Effect of Urban Vegetation Patterns on Land Surface Temperatures in the Bangkok Metropolitan Region. *Urban Transformational Landscapes in the City-Hinterlands of Asia: Challenges and Approaches* Singapore: Springer Nature Singapore.
Narkpitaks, N. 2016. Successful Water Management Planning in Thailand in the Past (1980, 1994, 1983, 1997-1999) *Improving Flood Management in Thailand*. Thailand: Thailand Development Research Institute Foundation.
Nassauer, J. I. 1995. Culture and changing landscape structure. *Landscape Ecology,* 10**,** 229-237.
NetCen. 2012. *The Framework approach to qualitative data analysis* [Online]. NetCen Learing Social Research. Available: http://www.natcen.ac.uk/events-and-training/our-training [Accessed 10 September 2021].
Nikomborirak, D. 2016. Climate Change and Institutional Challenges for Developing Countries: The Case of Water Resource Management in Thailand. *Improving Flood Management in Thailand*. Thailand: Thailand Development Research Institute Foundation (TDRI).
Nilubon, P., Veerbeek, W. & ChrisZevenbergen 2016. Amphibious Architecture and Design: A Catalyst of Opportunistic Adaptation? Case Study Bangkok. *Procedia- Social and Behavioral Sciences,* 216**,** 470-480.
NLA. 1985. *Bangkok-Thonburi city planning project 1958*. National Library of Australia.
NLPH. 2017. The 1915 historical boat transportation in Sanseab Canal 'Nai Lert White Boat'. *Nai Lert Park Heritage Home* [Online]. Available from: https://nailertgroup.com/en/nai-lert-park-heritage-home [Accessed July 2021].
Nopkhun, D. & Thadaniti, S. 1982. *Canals in Bangkok: History Changes and Their Impact,* Bangkok, Thailand, Chulalongkorn university printing house.

Nyumba, T. O., Wilson, K., Derrick, C. J. & Mukherjee, N. 2017. The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and Evolution*.
ONEP 1994. The Master Plan for the Conservation and Development of Krung Rattanakosin. Bangkok Thailand: The office of natural resource and environmental policy and planning.
ONEP 2017a. The Master Plan for the Conservation and Development of Krung Rattanakosin. Bangkok Thailand: The office of natural resource and environmental policy and planning.
ONEP 2017b. Publication proceeding of academic seminars. Old City Conservation and Development Subcommittee.
ONWR 2018. Water management plan 20 years 2018-2028. Thailand: Office of National Water Resource, Thailand.
ONWR 2021. Plan of water quality improvement of Sanseab canal. *In:* Resource, O. N. W. (ed.). Bangkok, Thailand.
Oosten, C. v., Moeliono, M. & Wiersum, F. 2018. From Product to Place—Spatializing governance in a commodified landscape. *Environmental Management,* 62**,** 157-169.
Oosten, C. v., Runhaar, H. & Arts, B. 2021. Capable to govern landscape restoration? Exploring landscape governance capabilities, based on literature and stakeholder perceptions. *Land Use Policy,* 104.
Oreszczyn, S. & Carr, S. 2008. Improving the link between policy research and practice: using a scenario workshop as a qualitative research tool in the case of genetically modified crops *Qualitative Research* 8**,** 473-497.
Parker, D. J. 2000. *Floods,* the USA and Canada, Routledge: Taylor & Francis Group.
Patarakiatsan, T. 2012. *Bangkok Synergy*. Master Degree, TU Delft.
Pattacini, L. 2021. Urban Design and Rivers: A Critical Review of Theories Devising Planning and Design Concepts to Define Riverside Urbanity. *Sustainability,* 13.
Pattarasumunt, S. 2021. *From sprawl to compact primary city: The application of Transit-Oriented Development and resurrection of water transport to enable livable and socially diverse environments in Bangkok* Master Degree, TU Delft.
Pekel, J.-F., Cottam, A., Gorelick, N. & Belward, A. S. 2016. High-resolution mapping of global surface water and its long-term changes. *Nature* 540**,** 418-422.
Pendleton, R. L. 1957. American Geographical Society Library Digital Photo Archive - Asia and Middle East. University of Wisconsin-Milwaukee Libraries.
Phanthuwongpakdee, N. K. 2016. *Living with Floods: Moving Towards Resilient Local-Level Adaptation in Central Thailand*. Joint Ph.D., King's College London and the National University of Singapore.
Phi, H. L., Hermans, L. M., Douven, W. J. A. M., Halsema, G. E. V. & Khan, M. F. 2015. A framework to assess plan implementation maturity with an application to flood management in Vietnam. *Water International***,** 1941-1707.
Pinkster, F. M. & Boterman, W. R. 2017. When the spell is broken: gentrification, urban tourism and privileged discontent in the Amsterdam canal district. *cultural geographies,* 24**,** 457-472.
Plieninger, T. & Bieling, C. 2012. Connecting cultural landscape to resilience. *Resilience and the cultural landscape, Understanding and managing change in human-shaped environments*. the United Kingdom: Cambridge University Press.
Poapongsakorn, N. & Limskul, A. 2013. Improving Flood Management Planning in Thailand: A Case of Chao Phraya River Basin. *SaciWATERs Waters Conference, CCW program*. Katmandu, Nepal: Thailand Development Research Institute (TDRI).
Porfyriou, H. 2019. Urban Heritage Conservation of China's Historic Water Towns and the Role of Professor Ruan Yisan: Nanxun, Tongli, and Wuzhen. *heritage,* 2**,** 2417-2443.
Prakitnonthakan, C. 2012. Rattanakosin Charter: The Thai Cultural Charter for Conservation. *Journal of the Siam Society,* 100.

Preissle, J. & Grant, L. 2004. Fieldwork Traditions: Ethnography and Participant Observation. *In:* Silverman, N. (ed.) *Foundations for Research Methods of Inquiry in Education and the Social Sciences*. London: Lawrence Erlbaum Associates.

Pressman, J. L. & Wildavsky, A. 1984. *Implementation. How great expectations in Washington are dashed in Oakland* Berkeley, CA, University of California Press.

Punyaratabandhu, S. 1985. Structural Problem in The Governance of Bangkok. *Crossroads: An Interdisciplinary Journal of Southeast Asian Studies,* 2.

Purnell, N. 2011. Thailand flooding update October 29, 2011: Bangkok's flood defenses hold. *Thailand* [Online]. [Accessed September 2021].

Rabionet, S. E. 2011. How I Learned to Design and Conduct Semi-structured Interviews: An Ongoing and Continuous Journey. *The Qualitative Report,* 16**,** 563-566.

RamaV, K. 1933. The Visit of Sanseab Canal. *Chao Dom Mother King Rama V, Merit-making Ceremony of the King Phra Chao Onpraphan Ramphai*. Thailand: Phra Jun Printing House Tha Phra Jun Phranakorn.

Ramkisor, N. 2016. *Bridging the gap*. MSc Architecture, TU Delft.

Ratanawaraha, A. 2013. Thailand: Bangkok. *In:* Shirley, I. & Neill, C. (eds.) *Asian and pacific cities : Development patterns*. Taylor & Francis Group.

Ratanawaraha, A. 2016a. Inequality, Fragility, and Resilience in Bangkok. *Building Resilience in Cities under Stress***,** 4-12.

Ratanawaraha, A. 2016b. Institutional Issues in Integrating Land Use Planning and Water Management in Thailand. *Improving Flood Management in Thailand*. Bangkok, Thailand: Thailand Development Research Institute Foundation (TDRI), International Development Research Centre (IDRC).

Ratclie, J. 2000. Scenario building: a suitable method for strategic property planning? *Futures Academy Articles*.

Raymond, C. M., Fazey, I., S.Reed, M., Stringer, L. C., Robinson, G. M. & Evely, A. C. 2010. Integrating local and scientific knowledge for environmental management. *Journal of Environmental Management,* 91**,** 1766-1777.

Reed, J., Vianen, J. v., Deakin, E. L., Barlow, J. & Sunderland, T. 2016. Integrated landscape approaches to managing social and environmental issues in the tropics: learning from the past to guide the future. *Global Change Biology,* 22.

Reed, M. S. 2008. Stakeholder participation for environmental management: A literature review. *Biological Conservation,* 141**,** 2417-2431.

Rishbeth, C. 2020. Articulating transnational attachments through on-site narratives and collaborative creative processes. *In:* Manzo, L. C. & Devine-Wright, P. (eds.) *Place Attachment : Advances in Theory, Methods and Applications*. the United Kingdom: Taylor & Francis Group.

Ritchie, J., Lewis, J., Nicholls, C. M. & Ormston, R. 2013. *Qualitative Research Practice: A Guide for Social Science Students and Researchers,* the United Kingdom, SAGE Publications, Inc.

Rittitid, A. 2017. The improvement of the Khlong Ku Mueng Moat, Bangkok. *The 4th National Conference on Public Affairs Management*. Bangkok, Thailand: Silpakorn University.

Rohring, A. & Gailing, L. 2012. Linking path dependency and resilience for the analysis of landscape development. *In:* Plieninger, T. & Bieling, C. (eds.) *Resilience and the cultural landscape, Understanding and managing change in human-shaped environments*. the United Kingdom: Cambridge University Press.

Rongwiriyaphanich, S. 2011. A Cross-cultural Analytical Framework for Territorial Development Policies: The Application to Flood Risk Management Policies in the Bangkok Metropolitan Region. *the 3rd World Planning Schools Congress*. Perth.

Rongwiriyaphanich, S. 2012. Effects of Land Policy on Hybrid Rural-Urban Development Patterns and Resilience: A case study of the territorial development in the Bangkok Metropolitan Region. *Regional Studies Association European Conference*. Natherland.

Rongwiriyaphanich, S. 2014. *Understanding culture in territorial management and its implications for spatial planning: The case of floodplain management in urbanised delta regions in the Netherlands and Thailand*. PhD Delft University of Technology.

RTS. 1887. *The historical map of an old town Bangkok: Royal Thai Survey Department*.

RTS. 1901. *The historical map of an old town Bangkok: Royal Thai Survey Department*.

RTS. 2006. *Phranakorn 1887*. Bangkok Thailand: Royal Thai Survey Department, The supreme command.

Saito, N. 2014. Challenges for adapting Bangkok's flood management systems to climate change. *Urban Climate,* 9**,** 89-100.

Sajor, E. E. & Onfsakul, R. 2007. Mixed Land Use and Equity in Water Governance in Peri-Urban Bangkok. *International Journal of Urban and Regional Research,* 31**,** 782–801.

Sayer, J., Sunderland, T., Ghazoul, J.-L., Pfund, J.-L., Sheil, D., Meijaard, E., Venter, M., Boedhihartono, A. K., Day, M., C. Garcia, Oostenj, C. v. & Buck, L. E. 2013. Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings of the National Academy of Sciences of the United States of America,* 110.

Schmutz, S. & Sendzimir, J. 2018. *Riverine Ecosystem Management: Science for Governing Towards a Sustainable Future,* Switzerland, Springer Open.

Schwarz, M. & Tanyaphituck, J. 2015. Risky Cities: Bangkok. Zürich: Swiss Re.

Selman, P. 2012. Landscape as integrating frameworks for human, environmental and policy process. *In:* Plieninger, T. & Bieling, C. (eds.) *Resilience and the Cultural Landscape*. the United Kingdom: Cambridge University Press.

Sevilla, R. C. 2012. An Exploration on the Prospects for Metropolitan Governance in Bangkok – A Review of Literature. *In:* Horayangkura, V., Jamieson, W. & Mallikamarl, P. (eds.) *The Design and Development of Sustainable Cities, International and Thai Perspectives on Urban Design in the 21st Century*. Thammasat University

Sharman, A. & Perkins, R. 2017. Post-decisional logics of inaction: The influence of knowledge controversy in climate policy decision-making. *Environment and Planning A Economy and Space,* 49**,** 2281–2299.

Sharpe, B., Hodgson, A., Leicester, G., Lyon, A. & Fazey, I. 2016. Three horizons: a pathways practice for transformation. *Ecology and Society,* 21.

Shinawatra, W. 2012. Understanding Cultural Landscapes in Thai Urban Context: Bangkok as A Neglected Water-Based City. *International Conference.* Bangkok: School of Architecture and Design, King Mongkut's University of Technology Thonburi.

Shuchaiya, K. 2001. *Traditional Thai Dictionary: Temple Palace Street Bridge Fort*, The Royal Academy.

Silrattana, P. 2015. *History of Nongchok Neighborhood* [Online]. Available: https://www.facebook.com/thisisnongchok [Accessed 20 December 2021].

Singkran, N. & Kandasamy, J. 2015. Developing a strategic flood risk management framework for Bangkok, Thailand. *Springer Science+Business Media Dordrecht,* 84**,** 933-957.

Siriphattanakun, H. 2020. *The study of water management system in ancient towns: A case study of Ayuttaya*. Doctor of Philosophy in Architecture, Chulalongkorn University.

Sirisrisak, T. 2009. Conservation of Bangkok old town. *Habitat International,* 33**,** 405-411.

Sirisrisak, T. & Akagawa, N. 2012. Cultural Rights and Conservation of Old Bangkok. *Journal of the Siam Society,* 100.

Slater, R., Frederickson, J., Thomas, C., Wield, D. & Potter, S. 2007. A critical evaluation of partnerships in municipal waste management in England. *Resources Conservation& Recycling,* 51**,** 643-664.

Smith, H., Pereira, M., Hull, A. & Bosch, C. K. v. D. 2014. The governance of open space decision-making around place-keeping. *In:* Dempsey, N., Smith, H. & Burton, M. (eds.) *Place-keeping: Open space management in practice*. London: Routledge.

Smith, J. & Firth, J. 2011. Qualitative data analysis: application of the framework approach. *Nurse Researcher,* 18**,** 52-62.

Söderholm, K., Pihlajamäki, M., Dubrovin, T., Veijalainen, N., Vehviläinen, B. & Marttunen, M. 2018. Collaborative Planning in Adaptive Flood Risk Management under Climate Change. *Water Resour Manage,* 32**,** 1383-1397.

Somboon, V. & Jaroenchaisakul, S. 2011. Flood Mitigation and Management in Bangkok Metropolitan Area. Bangkok, Thailand: Department of Drainage and Sewerage, Bangkok Metropolitan Administration.

Songsriri, V. 2017. The end era of crafting in Trok Banpan. *Articles of historical and traditional culture in Thailand by Valilak Songsriri* [Online]. Available from: https://walailaksongsiri.com/2017/08/07/ปิดฉาก-งานช่างชั้นครูที/ [Accessed July 2023].

Srirojanapinyo, A. 2003. *Open to the Public! A New Network of Communal Recreational Waterfront Space in Bangkok*. Master of Science in Architecture Studies, Massachusetts Institute of Technology.

Stenseke, M., Lindborg, R., Dahlberg, A. & Statmo, E. 2012. System or arena? Conceptual concerns around the analysis of landscape dynamics. *In:* Pleninger, T. & Bieling, C. (eds.) *Resilience and the cultural landscape, Understanding and managing change in human-shaped environments*. the United Kingdom: Cambridge University Press.

Stephenson, J. 2008. The Cultural Values Model: An integrated approach to values in landscapes. *Landscape and Urban Planning,* 84**,** 127-139.

Stiegler, S. 2021. On Doing Go-Along Interviews: Toward Sensuous Analyses of Everyday Experiences. *Qualitative Inquiry,* 27**,** 364-373.

Storey, D. 2012. Incompatible partners? Urban poor communities and river systems in Bangkok, Thailand. *International Development Planning Review,* Vol.34.

Suksawang, W. 2012. Holistic Approach for Water Management Planning of Nong Chok District in Bangkok, Thailand. *UC Berkeley Hydrology*.

Surajaras, R. 2019. *Recharging Bangkok: A Climate Adaptive for Saen Saeb Canal*. Master of Landscape Architecture, The Rhode Island School of Design Providence.

Suwanwijit, T. 2014. Bangkok Metropolitan Authority. [Accessed 10 October 2021].

Sweeting, D. 2002. Leadership in Urban Governance: The Mayor of London. *Local Government Studies,* 28**,** 3-20.

Swyngedouw, E. & Heynen, N. C. 2003. Urban Political Ecology, Justice and the Politics of Scale. *Antipode,* 5**,** 898-918.

Swyngedouw, E., Kaika, M. & Castro, E. 2002. Urban Water: A Political-Ecology Perspective. *Water Management in Urban Areas,* 28**,** 124-137.

Tachakitkachorn, T. 2000. Morphological Study of An Orchard System in The Lower Basin of Chao Phraya Delta: A case Study of Amphawa Neighborhood. *Nakhara***,** pp. 37-55.

Takaya, Y. 1969. Topographical Analysis of the Southern Basin of the Central Plain, Thailand. *Tanan Ajia Kenkyi (The Southeast Asian Studies),* 7**,** 293-300.

Talen, E. 1996. Do Plans Get Implemented? A Review of Evaluation in Planning. *Journal of Planning Liturature,* 10**,** 248-259.

Tanabe, S. 1997. Historical geography of the canal system in the Chao Phraya river deltas. *Journal of the Siam Society,* 65**,** 23-72.

Tantinipankul, W. 2012. Reviving the Neglected Heritage of the Rattanakosin Era: The Case of the Old Chao Phraya River Oxbow. *Journal of the Siam Society,* 100.

Tanusin, A. 2015. *History of Grom Phrapa* [Online]. Thailand. Available: https://prezi.com/d-pd1sdyy4pt/5/ [Accessed August 2023].

Taylor, K. 2018. Connecting Concepts of Cultural Landscape and Historic Urban Landscape: The Politics of Similarity. *Built Heritage,* 3.

Taylor, K. & Lennon, J. 2011. Cultural landscapes: a bridge between culture and nature? *International Journal of Heritage Studies,* 17.

Taylor, S. 1997. Critical Policy Analysis: exploring contexts, texts and consequences. *Discourse: studies in the cultural politics of education,* 18.

Thaitakoo, D. 2017. Urbanization and it's impacts on ecological services of Bangkok's urban ecosystem. *The second TOT for Urban Climate Change Adaptation in Southeast Asia International Meeting on Building Capacity for Urban Climate Change Adaptation in Southeast Asia*. EGL Hotel Bangkok, Thailand: TOT.

Thaitakoo, D. & McGrath, B. 2008. Mitigation, Adaptation, Uncertainty - Changing Landscape, Changing Climate: Bangkok and the Chao Phraya River Delta. *UC Berkeley: College of Environmental Design: Places,* 20**,** 30-35.

Thaitakoo, D. & McGrath, B. 2010. Bangkok Liquid Perception: Waterscape Urbanism in the Chao Phraya River Delta and Implication to Climate Change Adaptation. *Water Communities*. Emerald Group Publishing Limited.

Thaitakoo, D. & McGrath, B. 2017. The Landscape of Bangkok's Agricultural Fringe and City Region Sustainability: An Ecological and Cultural Co-Evolution. *Sustainable Landscape Planning in Selected Urban Regions*. Science for Sustainable Societies. Springer, Tokyo.

Thaitakoo, D., McGrath, B., Srithanyarat, S. & Palopakon, Y. 2012. Vanishing Landscape: The Hydro-Agricultural Landscape of Bangkok, Thailand. *(Un)anticipated Futures Symposium 2012 Proceedings*. Chulalongkorn University, Bangkok Thailand: New York Coordinator and Records.

Thaitakoo, D., Nantavisai, M. & Ansusinha, P. 2018. Urban Ecology: Landscape Element and Ecosystem Services. *Unisearch Journal,* 5**,** 21-26.

Thanapet, K. & Kung, S.-F. 2015. Spatial Composition and Configuration Changes in the Bangkok Metropolitan Region Landscape. *Nakhara : Journal of Environmental Design and Planning,* 11**,** 9-28.

Thanawat Jarupongsakul, Y. K. 2019. The Imagescape of the Chao Phraya delta into the year 2020. *Sarasart*.

Thanvisitthpon, N., Shrestha, S. & Pal, I. 2018. Urban Flooding and Climate Change: A Case Study of Bangkok, Thailand. *Environment and Urbanization Asia,* 9**,** 86–100.

Thienvutichai, K. 2019. *Redefining Bangkok's Inclusive Water-Based Society Flood Resilience Planning of Adaptive and Performative Hybrid Infrastructure Network*. master thesis, Delft University of Technology.

Thompson, J. 2022. A Guide to Abductive Thematic Analysis. *The Qualitative Report* 27**,** 1410-1421.

Todt, O. & Lujan, J. L. 2014. Values and Decisions: Cognitive and Noncognitive Values in Knowledge Generation and Decision Making. *Science, Technology, & Human Values,* 39**,** 720-743.

Tohiguchi, M., Denpaiboon, C., Matsuda, H. & Hashimoto, S. 2002. Transformation of the canal-side Settlements in Greater Bangkok. *J. Archit. Plann. Environ. Eng. AIJ,* 551**,** 245-252.

Torrès, D. K. 2004. Bangkok and the Bangkok metropolitan region. *Atlas of Thailand: Spatial Structure and Development*. Marseille: IRD Éditions.

TPD 1997a. Executive Report: The development Minburi District. *In:* Town Planning Department, B. M. A. (ed.). Bangkok, Thailand: Faculty of Architecture, Silpakorn University.

TPD 1997b. Executive Report: The Redevelopment Project of Nongchok District. *In:* Town Planning Department, B. M. A. (ed.). Bangkok, Thailand: Faculty of Architecture, Silpakorn University.

TPD 2014. Final Report: The redevelopment project of the Minburi Upatum Community and the area along Sanseab Canal. *In:* Town Planning Department, B. M. A. (ed.). Bangkok, Thailand: Phisut Technology Co. Ltd.
TPD. 2015. *Greater Bangkok Plan 2533* [Online]. Available: https://www.facebook.com/100066864980608/posts/803796129694682/ [Accessed August 2023].
TPD 2017. Khlong Rob Krung Redevelopment Plan. *In:* Department, T. P. (ed.). Bangkok Metropolitan Administrator.
TPD 2019. Planning for central Bangkok *In:* hearing, P. d. f. p. (ed.) *The Bangkok comprehensive town plan (Draft for the 4th version)*. Bangkok. Thailand: Town Planning Department, Bangkok Metropolitan Administration.
TPD 2020a. Annual Report. *In:* Department, T. P. (ed.). Bangkok, Thailand: Bangkok Metropolitan Administration.
TPD 2020b. Final Report: The redevelopment of Minburi neighborhood and the surrounding areas. *In:* Town Plan Department, B. M. A. (ed.). Bangkok, Thailand: PSK Consultation Company.
Tracy, S. J. 2018. A Phronetic Iterative Approach to Data Analysis in Qualitative Research. *Journal of Qualitative Research*.
UCLG & OECD 2016. Asia Pacific: Thailand Unitary Country. *Joint research program*. United Cities and Locals Governments.
UDDC 2015. Executive summary report: Masterplan of conservation and redevelopment project in Kudi Chin Khlongsan. *Bangkok 250 years*. bangkok250.org: Chula University Chulalongkorn University and Department of city planning BMA.
UN. 2022. *World Population Prospect* [Online]. Available: https://worldpopulationreview.com [Accessed May 2024].
Unakul, M. H. 2012. Reconnecting Bangkok's Heritage Landscape: Urban Waterways and the Modern City. *Journal of the Siam Society,* 100.
Unakul, M. H. 2022. Finding heritage-based fixes for floods *Heritage Matters* [Online]. Available: https://www.bangkokpost.com/opinion/opinion/2423716/finding-heritage-based-fixes-for-floods [Accessed 10 September 2023].
UNESCO. 2010. *Cultural landscape* [Online]. UNESCO World Heritage Conventions. Available: https://whc.unesco.org/en/series/26/ [Accessed March 2022].
UNESCO 2011. Recommendation on the Historic Urban Landscape, including a glossary of definitions. *New Life for Historic Cities: The Historic Urban Landscape Approach Explained*. Paris: UNESCO World Heritage Centre.
UOA. 2019. Answers to frequently asked questions about thematic analysis. Available from: https://cdn.auckland.ac.nz/assets/psych/about/our-research/documents/Answers%20to%20frequently%20asked%20questions%20about%20thematic%20analysis%20April%202019.pdf [Accessed 20 August 2021].
Webster, D. & Maneepong, C. 2009. Bangkok: Global actor in a misaligned national governance framework. *City: analysis of urban trends, culture, theory, policy, action,* 13.
Willems, W. J. H. & Schaik, H. P. J. v. 2015. *Water & Heritage Material, conceptual and spiritual connections*, Sidestone Press, Leiden.
Winton, S. 2013. Rhetorical analysis in critical policy research. *International Journal of Qualitative Studies in Education,* 26**,** 158-177.
Wolfe, D. a. 2002. Metropolitan Governance Background Study: What do we need to know?
Wongtimarat, K. 2013. *Conservation Guildlines For Bangkok Yai Canal and it's Communities*. the Degree of Master, Chulalongkorn University.
Worldbank. 2011. *Jakarta: Urban Challenges in a Changing Climate* [Online]. The World Bank Group. Available: https://www.worldbank.org/en/news/feature/2011/11/03/jakarta-urban-challenges-in-a-changing-climate [Accessed 28 September 2023].

Worldbank 2012. Rapid Assessment for Resilient Recovery and Reconstruction Planning. *In:* Bank, T. W. (ed.). Pathumwan Bangkok Thailand.

Yin, R. K. 2003. *Case Study Research Design and Method,* the United State of America, SAGE Publication, Inc.

Yodsurang, P., Hiromi, M. & Yasufumi, U. 2015. A Traditional Community in the Chao Phraya River Basin: Classification and Characteristics of a Waterfront Community Complex. *Asian Culture and History,* 8.

Yodsurang, P. & Yasufumi, U. 2015. A Traditional Community in the Chao Phraya River Basin II: Influence of Water Circulation on the Traditional Living Culture according to the Settlement Pattern. *Asian Culture and History,* 8.

Yusuf, A. A. & Francisco, H. 2009. Climate Change Vulnerability Mapping for Southeast Asia. *EEPSEA*

Zevenbergen, C., Kolaka, K., Herk, S. v., Escarameia, M., Gersonius, B., Serre, D., Walliman, N., Bruijn, K. M. d. & Graaf, R. d. 2013. Assessing quick-wins to protect critical urban infrastructure from floods Case study (three urban communities) Bangkok, Thailand. *International Conference on Flood Resilience: Experiences in Asia and Europe*. Exeter, United Kingdom: ICFR.

Zube, E. H. 1987. Perceived land use patterns and landscape values. *Landscape Ecology,* 1**,** 37-45.

Appendices

Appendix 1 Detail in data analysis and data collection

A. Policy documents used in the study

Policy documents and/or government papers	Year	Owner
1. Rattanakosin Plans 1994, 1997	1994, 1997	RC-ONEP
2. Rattanakosin Plan (announce 2020)	2017	RC-ONEP
3. Heritage Corridor, Banglampoo Canal	2016	TPD
4. Khlong Rob Krung Redevelopment Projects	2017	TPD
5. Redevelopment plan in Minburi	1997	TPD
6. Redevelopment plan in Minburi Upatum 2	2014	TPD
7. Redevelopment plan in Minburi District	2020	TPD
8. The Reclamation of Sanseab Canal	2021	ONWR
9. Redevelopment plan in Nongchok	1997	TPD
10. Chaophraya Development Plan	2016	PWD
11. City Planning annual reports	2015-2020	TPD
12. The Comprehensive Plan (draft) 2020s	2019	TPD
13. Road Rail Boat Policy	2019	DSD
14. Flood prevention annual reports	2007-2020	DSD
15. Plan of increasing drainage capacity	2015	DSD/ CODI
16. The Delta Flood management policy	2013	JICA
17. Bangkok Resilience Strategy (pioneer by Rockefeller Foundation)	2017	BMA
18. The 20 years of water management policy	2018	ONWR
19. Bangkok 250 years Plan: Kadi Chin Khlongsan riverside community redevelopment	2015	TPD
20. The study of preservation and development of Talad Noi-China Town, and surrounding area	2015	TPD
21. Chao Phraya For All: a public hearing document	2016	BMA
22. Redevelopment plan in Minburi District: a public hearing document	2020	TPD
23. Construction of water treatment plants in Minburi area	2020	DSD

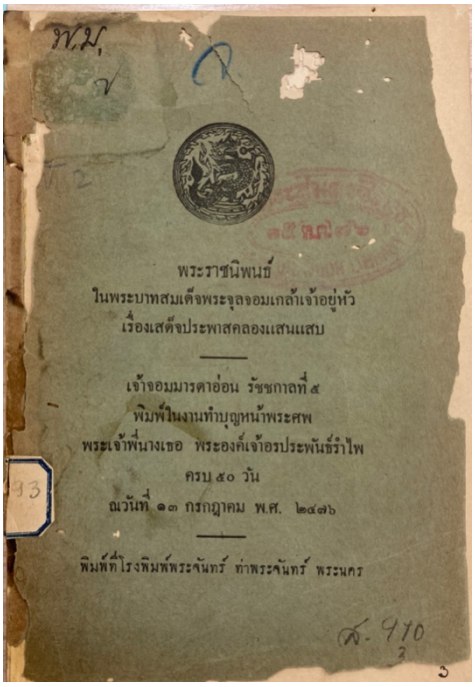
B. Selected data used in mapping reviews and the case study selection

	Data description	Format	Source
1.	Human settlement layer	tiff	GHS and Atlas
2.	Land use land cover (LULC) year	tiff	Esri
3.	Water surface recording	tiff	JRC Global surface water
4.	Land elevation DEM file	tiff	STRM, NASA Earth data
5.	Flood record Chao Phraya Delta 2006-2020	shp	GISDA
6.	The urban vulnerable flood point	shp	Bangkok GIS, DGDA
7.	Building and street layers	shp	Bangkok GIS
8.	Element's location of flood management - Watergate location - Water pumping location - Flood Dike location - Main canals for water drainage	shp	Bangkok GIS, DSD, RID
9.	Water body and waterways network	shp	Bangkok GIS, DSD, RID
10.	Land use policy (the 4th Comprehensive Plan) - Future TOD - Existing and future water transportation - Existing and future Mass transportation - Proposed development projects	jpg	TPD
11.	Location of drainage projects involving BUW	jpg	DSD
12.	Location of redevelopment projects involving BUW	jpg	TPD
13.	Location of projects involving historical BUW	jpg	ONEP

C. Selected archive materials used in desk review

Historical document	Published	Types
1. Royal chronicle by King Rama II (1809-1824) - Close the watergate at BangKeaw Canal (1813) - Excavate waterways for the orchard garden	2012	Document
2. Royal chronicle by King Rama III (1824-1851) - Fort and moat excavation - Canal excavation - Flood event (Dec 1831) - Bang Kanak Canal excavation and renovate Phrakanong Canal - Earth quark and waving in the River - Covered the excavated canal - Fort and canal- Meangnakorn KeanKan excavated	2012	Document
3. Royal chronicle by King Rama IV (1851-1868) - Closed the shortcut canal- Khlong Lad - Excavated three streets and canals - Built the bridge crossing the waterway - Transport by boat seeing the residents (May 1851) - Defensive canals excavated - Fort and Padung Krungkaseam Canal excavated (1852) - Celebrating the Padung Krungkaseam Canal - Gave foreigners the lands and excavated Thanon Tong Canal - The river turned red-colour (1864) - Pasri Chareon Canal excavation	1961	Document
4. The Sanseab Canal visited by the chronicle of King Rama V	1933	Document
5. The eastern waterways line drawing record	1886	Map
6. The Rattanakosin drawing map	1887	Map
7. The proposal of western waterway excavation	1904	Map
8. The boundary of Minburi province	1928	Map
9. The Rattanakosin drawing map	1932	Map
10. The construction plan of Sanseab canal located in the inner city	1983	Plan
11. The management plan of Bangkok waterways to prevent flood	1984	Map
12. The arial photograph of Rattanakosin	1958	Photograph
13. The historical photographs of the waterways in Rattanakosin	1840s-1960s	Photograph

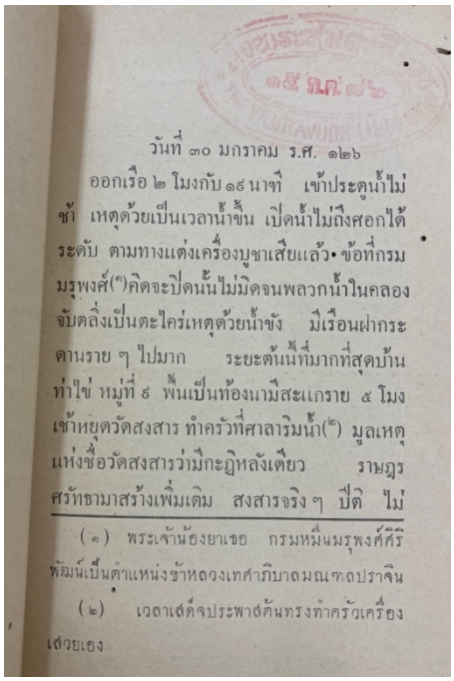
D. Examples of historical material using in desk review



พระราชนิพนธ์
ในพระบาทสมเด็จพระจุลจอมเกล้าเจ้าอยู่หัว
เรื่องเสด็จประพาสคลองแสนแสบ

เจ้าจอมมารดาอ่อน รัชกาลที่ ๕
พิมพ์ในงานทำบุญหน้าพระเพลิง
พระเจ้าพี่นางเธอ พระองค์เจ้าอรประพันธ์รำไพ
ครบ ๕๐ วัน
ณวันที่ ๑๓ กรกฎาคม พ.ศ. ๒๔๗๖

พิมพ์ที่โรงพิมพ์พระจันทร์ ท่าพระจันทร์ พระนคร



วันที่ ๓๐ มกราคม ร.ศ. ๑๒๖
ออกเรือ ๒ โมงกับ ๑๕ นาที เข้าประตูน้ำไม่
ช้า เหตุด้วยเป็นเวลาน้ำขึ้น เปิดน้ำไม่ถึงศอกได้
ระดับ ตามทางแต่งเครื่องบูชาเสียแล้ว• ข้อที่กรม
มรุพงศ์(*)คิดจะปิดนั้นไม่มิดจนพลวกน้ำในคลอง
จับตลิ่งเป็นตะไคร่เหตุด้วยน้ำขัง มีเรือนฝากระ
ดานราย ๆ ไปมาก ระยะต้นนี้ที่มากที่สุดบ้าน
ท่าไข่ หมู่ที่ ๘ พื้นเป็นท้องนามีสะแกราย ๕ โมง
เช้าหยุดวัดสงสาร ทำครัวที่ศาลาริมน้ำ(*) มูลเหตุ
แห่งชื่อวัดสงสารว่ามีกะฎีหลังเดียว ราษฎร
ศรัทธามาสร้างเพิ่มเติม สงสารจริง ๆ ปีติ ไม่

(๑) พระเจ้าน้องยาเธอ กรมหมื่นมรุพงศ์ศิริ
พัฒน์เป็นตำแหน่งข้าหลวงเทศาภิบาลมณฑลปราจิน
(๒) เวลาเสด็จประพาสต้นทรงทำครัวเครื่อง
เสวยเอง

Fig D-1: The cover and the example paragraph of the chronicle by King Rama V: The Sanseab Canal visited (1933) Source: Thailand National Archives, FAD

An example of translation from the King Rama V's chronicle (translated from Thais):

"The departer time, 8:19 am, (the boat) access quickly pass the watergate (at Tha Kai) caused by the tidal not yet rising. […] There were the wooden houses and water plant, Pak Tob Chawa on the water surface…"



Fig D-2: The examples of historical maps, Bangkok Yai Canal and surrounding- The western Bangkok, recorded in 1963
Source: Thailand National Archives, FAD



Fig D-4 The arial photograph of Rattanakosin: Sanseab Canal (Left), Chaophraya River (Right) (NLA, 1958)



Thousands Live On Bangkok's Canals

BANGKOK. — The waters of the river Chao Phya and its numerous connecting canals are home to tens of thousands of this city's 1,000,000 people who live in boats upon the muddy surface, or in houses perched on spindly poles above the banks.

The river and its canals—"klongs" they are called—provide them with a compete sanitary system, water for cooking, drinking, laundering and the brushing of teeth. Most of the water dwellers are, by oriental standards, scrupulously clean. They are constantly scrubbing clothes or bathing.

Along almost every street in Bangkok there are people bathing in public with an almost prudish discretion. Women bathe in a piece of cloth called a sarong. It is knotted above the breasts and falls below the knees. When they plunge into the water the garment billows around them. After a skillful lathering they emerge and transfer themselves adroitly into a dry garment. The men bathe in a loincloth. However, the slender cream-coloured children dive and splash in the nude.

Bangkok stands only four feet above sea level. Consequently almost every road and housing project means another canal. Earth from the excavations makes the embankments upon which roads and houses are built.

NETWORK OF WATERWAYS

As a result, the capital is a network of waterways. In residential districts, the klongs are spanned by arched bridges and are often shaded picturesquely by trees. Elsewhere, the klongs are busy avenues of traffic for hundreds of large and small craft, poled, paddled, rowed and motor-driven.

Down the river Chao Phya, rice for the bowls of Asia is brought to Bangkok in long trains of barges with accommodation fore and aft of the cargo, which is stored amidships. The barge trains are pulled by antiquated, noisy steam tugs.

Downstream from the rich teak-bearing forests of the north come the great rafts of logs to the Bangkok sawmills. Since teak stealing is almost a profession in Siam, the logs are guarded by watchmen who build flimsy houses of attap on the rafts.

The klongs branching off from the river are crowded with boats carrying loads of vegetables, fruit, coconuts, charcoal and almost every conceivable commodity. At canal junctions many sizeable colonies have grown up, and at each there is a tangle of boats piled high with fish, meat and vegetables.

FLOATING MARKETS

These are the famous floating markets. The wooden houses fringing the water's edge sell hardware, fishing tackle and even electrical equipment. Hairdressers' shops, coffee shops and private houses stand open to traffic.

Life on the river and canals of Bangkok is lived in public. Only the night brings privacy.

From the riverside houses, steps run down into the water. Here the families bathe, launder and fish. From the steps they bargain and buy from the passing boats.

Some sampans are self-contained restaurants and, by hailing a succession of these— the Chinese noodle man, the rice curry boat, the woman who sells the sweet and glutinous Siamese desserts—the riverside housewife can provide a full-course meal for her family without the worry of marketing and cooking. These vendors each have their distinctive way of announcing their wares, some with peculiarly plaintive cries, others with bells or bamboo clappers.

In the early morning, dozens of Buddhist priests paddle skillfully in tiny, narrow boats—from a distance they seem to float miraculously on the water—collecting their daily gifts of food from the faithful. The priests make a vivid splash of colour in their bright yellow robes, since most of the ordinary riverfolk are dressed rather drably in blacks and whites.

Beyond the bustling markets the houses on the klongs become

Fig D-5 The newspaper published Friday 20 June 1952, Page 5
Source: http://nla.gov.au/nla.news-article78735408 accessed July 2021

E. List of interviewees in semi-structured and go-along interviews (n=29)

GA-01	Public Works and Town& Country Planning Department (PWTPD)
GA-02	Town Planning Department (TPD)
GA-03	Royal Irrigation Department (RID)
GA-04	Drainage and Sewerage Department (DSD)
GA-05	Rattanakosin Committee, the Office of National Environment Policy and Planning (RC-ONEP)
GA-06	Urban Development and Renewal Office, TPD (UDR-TPD)
GA-07	Fine Art Department (FAD)
IA-08	SPAFA-ICOMOS
IA-09	UN-Habitat

EP-01	Urban planner	RE-01	Community leader (Banpantom)
EP-02	Ecological landscaper	RE-02	Resident (Banpantom)
EP-03	Heritage experts	RE-03	Resident (Banpantom)
EP-04	Water resource engineer	RE-04	Resident (Banpantom)
EP-05	Political science researcher	RE-05	Community leader (Minburi Upatum)
EP-06	Hydrological ecologist researcher	RE-06	Resident (Minburi Upatum)
EP-07	Environmental engineer	RE-07	Resident (Minburi Upatum)
EP-08	Landscape practitioner	RE-08	Community leader (Talad Nongchok)
EP-09	Academic historian	RE-09	Resident (Talad Nongchok)
EP-10	Local historian	RE-10	Resident (Talad Nongchok)

Note: Government agencies (GA), International agencies (IA), Experts and practitioners (EP), Residents (RE)

F. List of participants in workshops (n=24)

Waterbody experts (WB)		Place-making experts (PM)	
BE-01	Built environment AC	HC-01	Heritage landscape AC
BE-02	Water engineer GA	HC-02	Urban heritage PR
BE-03	Water engineer AC	HC-03	Urban heritage AC
BE-04	Water engineer AC	HC-04	Urban heritage GA
FE-01	Landscape PR	HC-05	Landscape heritage AC
FE-02	Hydro-ecologist GA	HC-06	Conservation heritage AC
FE-03	Landscape ecologist AC	UP-01	Urban planner GA
FE-04	Landscape ecologist AC	UP-02	Urban planner PR
FE-05	Landscape designer PR	UP-03	Urban planning AC
FE-06	Landscape planner PR	UP-04	Political water management AC
FE-07	Hydro ecologist AC	UP-05	Political Science& policy planner AC
FE-08	Landscape planner AC	UP-06	Urban planning PR

Note: Academics (AC), Government agencies (GA), Practitioners (PR)

G. Details of the semi-structured interview conducted (GA/IA/EP)

Participant	Dates of interview	Duration	Location
GA-01 PWTPD	30 Nov 2021	2 hr. 40 min	Online
GA-02 TPD	14 Dec 2021	1 hr. 20 min	Online
GA-03 RID	28 Dec 2021	1 hr. 30 min	At the office
GA-04 DSD	8 Feb 2022	1 hr. 20 min	At the office
GA-05 RC-ONEP	13 Jan 2022	1 hr. 20 min	Online
GA-06 URD-TPD	22 May 2022	1 hr. 30 min	At the office
GA-07 FAD	28 Feb 2022	1 hr. 30 min	At the office
IA-08 SPAFA-ICOMOS	8 Dec 2021	1 hr. 30 min	Online
IA-09 UN-Habitat	12 July 2022	1 hr. 30 min	Online
EP-01 Urban planner	5 Dec 2021	2 hr.	Online
EP-02 Ecological landscaper	6 Jan 2022	1 hr. 40 min	Online
EP-03 Heritage experts	7 Jan 2022	4 hr. 10 min	At the office
EP-04 Water resource engineer	6 May 2022	1 hr. 20 min	At the office
EP-05 Political science researcher	17 May 2022	1 hr. 20 min	Online
EP-06 Hydrological ecologist	5 May 2022	1 hr.	At the cafe
EP-07 Environmental engineer	11 May 2022	1 hr.	At the office
EP-08 Landscape practitioner	7 Feb 2022	1 hr.	At the cafe
EP-09 Academic historian	21 Jan 2022	2 hr. 30 min	At the temple
EP-10 Local historian	7 April 2022	2 hr.	At the cafe

H. Detail of the go-along interview conducted in the communities' spaces (RE)

Participants	Date of interview	Duration
RE-01 Community leader (CO-01)	30 Nov 2021	4 hr.
RE-02 Resident (CO-01)	14 Dec 2021	2 hr. 20 min
RE-03 Resident (CO-01)	28 Dec 2021	3 hr. 30 min
RE-04 Resident (CO-01)	8 Feb 2022	2 hr.
RE-05 Community leader (CO-02)	13 Jan 2022	4 hr. 20 min
RE-06 Resident (CO-02)	22 May 2022	3 hr. 30 min
RE-07 Resident (CO-02)	28 Feb 2022	2 hr.
RE-08 Community leader (CO-03)	8 Dec 2021	3 hr. 30 min
RE-09 Resident (CO-03)	12 July 2022	2 hr. 30 min
RE-10 Resident (CO-03)	5 Dec 2021	3 hr.

Note: CO-01 = Banpantom, CO-02 = Minburi Upatum, CO-03 = Talad Nongchok

I. Details of the eight focus groups/workshops conducted between Feb-Mar 2023

	Participants	Dates of focus group	Duration	Study site discussion
Group 1				
WB	BE-01 Built environment AC	24 Feb 23	2.30 hr.	CO-01
WB	FE-01 Landscape planner PR			
PM	HC-01 Heritage landscape AC			
Group 2				
WB	BE-02 Water engineer GA	25 Feb 23	2 hr.	CO-02
PM	HC-02 Urban heritage PR			
PM	UP-01 Urban planner GA			
Group 3				
WB	FE-02 Hydro-ecologist GA	27 Feb 23	2 hr.	CO-03
WB	FE-03 Landscape ecologist AC			
PM	UP-02 Urban planner PR			
Group 4				
PM	HC-03 Urban heritage AC	28 Feb 23	2.30 hr.	CO-03
WB	FE-04 Landscape ecologist AC			
WB	BE-03 Water engineer AC			
Group 5				
WB	FE-05 Landscape designer PR	1 Mar 23	2 hr.	CO-02
WB	BE-04 Water engineer AC			
PM	UP-03 Urban planning AC			
Group 6				
PM	UP-04 Political water management AC	3 Mar 23	2.30 hr.	CO-01
PM	HC-04 Urban heritage GA			
WB	FE-06 Landscape planner PR			
Group 7				
WB	FE-07 Hydro ecologist AC	13 Mar 23	2.50 hr.	CO-03
PM	HC-05 Landscape heritage AC			
PM	UP-05 Policy planner AC			
Group 8				
WB	FE-08 Landscape planner AC	15 Mar 23	2.30 hr.	CO-01
PM	HC-06 Conservation heritage GA			
PM	UP-06 Urban planning PR			

J. List of questions for interviews

Change/current situation

- How do you describe these waterways and their transformation?
- How do you describe causes of the change in these waterways?
- How do you describe the waterways management's directions in history and current one?
- How do you describe the management of these waterways before and after the project implementation? Have you engaged with these projects?
- How do you describe your experience/value/function of these waterways?
- How was the relationship between you and the waterways before and after project implemented?

Future vision

- To what extent will this current BUW management [of these sites] influence any change in the future?
- To what extent are BUW's management plans [of these sites] fit for the future?
- How do you see the future change of Bangkok's urban waterways?
- How do you describe the desirable change/ recommendation management of Bangkok's urban waterways for the future?

K. List of questions for focus group/workshops

Discussion of the dilemma

Activity A: Bangkok urban waterway context (45 mins)

- How do you prioritise these 16 schemes to manage BUW? Could you range them (on the table…)?
- Explain why you chose your first top three and last three schemes (more or less).
- Discuss your opinion with other participants.
- How can you choose one or more of these 5 scenarios?
- Explain why you chose those particular schemes and why not others.
- Discuss your opinion with other participants.

Activity B: Sites context (30 mins)

- How can you choose one or more of these 5 scenarios due to the communities?
- Explain why you chose those particular schemes and why not others.
- Please discuss with each other using 16 schemes to develop one shared vision for the particular site.

Activity C: Summary (30 mins)

- To what extent does your shared vision contribute or relate to the recent governance direction?
- How do you describe how your shared vision can be implemented in practice?
- What are the essential conflicts which arise from a shared vision that you suggest?
- To what extent do you think these conflicts can be overcome, and how?

L. Site survey information

Waterways	Transport/ access	Dates
1. The Chaophraya River, the eastern conservation waterways		
(a-i) Pak Khlong Talad	The Riverside: Take public boat transport	18 Jan 2022
(a-iii) China Town	The Riverside: Take public boat transport	18 Jan 2022
(a-ii) Ban Panthom CO-01	No boat transport	2 Feb 2022
2. Sanseab waterway		
(b-i) Ban Krou	Sanseab Canal: Take public boat transportation	10 Jun 2022
(b-ii) Minburi CO-02	Sanseab Canal: Take public boat transportation	10 Mar 2022
(c-ii) Nongchok CO-03	No boat transport, Take private boat	3 Mar 2022
3. Phrakanong- Phraweat waterways		
(b-iii) Phrakanong	(The boat transport was temporarily closed.)	5 May 2022
(c-iii) Talad Huatakea	(The boat transport was temporarily closed.)	5 May 2022
4. Western waterways		
(a-iv) Kudi Chin	The Riverside: Take public boat transport	13 Jun 2022
(b-iv) Talad Phu	(The boat transport was temporarily closed.)	16 Jun 2022
(c-iv) Bang Phratun	(Cannot access private properties)	16 Jun 2022

Table L-1 Detail of the site surveys



Fig L-1: Eastern-conservation waterway transportation (Padund Krungkaseam Canal), 13th Jun 2022



Fig L-2: Sanseab waterway transportation, 10th Mar and 10th Jun 2022 (Left) new route Minburi-Sribunreung, (Right) Sribunreung-Pan Fah route



Fig L-3: Kudi Chin community and nearby area, 13th Jun 2022
(Left) overland flood nearby the River, (Middle) The waterway's edge, (Right) The watergated at Khlong Bangkokyai Canal connected with the River

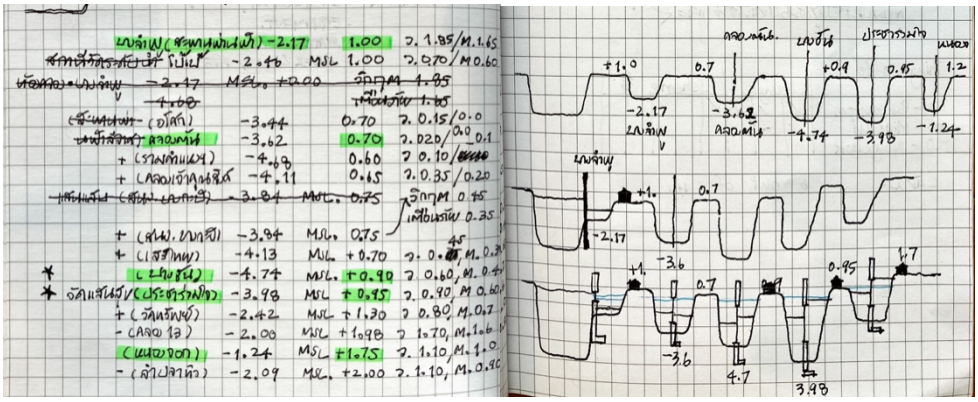


Fig L-4 The example of hand sketch and notes taken of water-level during the survey

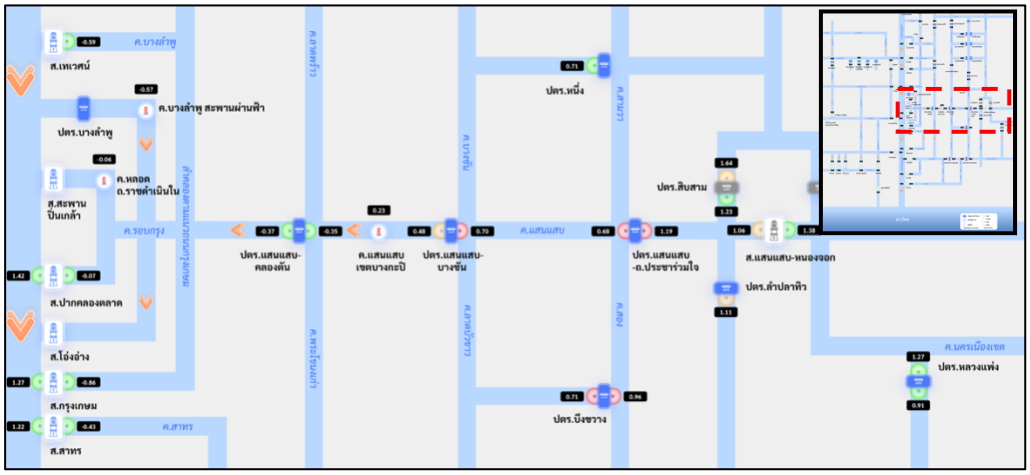


Fig L-5: The waterway map with the water-level information and the watergate location related the three sites studied, Source: DSD website accessed Sep-Nov 2022

Appendix 2 Additional information on Bangkok context

A. Examples of policy discourses (translated into English)

1- Participation report in public hearing of Rattanakosin Plan 2020 by RC-ONEP

"The current dam was not intended to blend in with the community and has destroyed its identity. Historically, when the flood season began in November at the Kanlayanamitr Temple (western) riverbank area, the water surged in and villagers could go fishing for prawns, crabs, and fish, but this way of life is no longer possible due to dam construction. Although the watergate prevents flooding, it also ruins the aesthetic appeal. Floodgates are ineffective because the barrier has just one side that can hinder water flow" (ONEP, 2017 Report of participation)

2- The 20-year water resource plan by ONWR (2018-2038)

"Initiative 6 effective water management: In order to establish effective water management, it's essential to enact legislation and create a centralized organization dedicated to overseeing water resources. Additionally, fostering research initiatives and collaborating with foreign nations on water management endeavors are crucial steps toward ensuring efficient water usage and conservation." (ONWR, 2021 Page 3-4)

3- The 11-year reclamation of Sanseab Canal by ONWR (2021-2031)

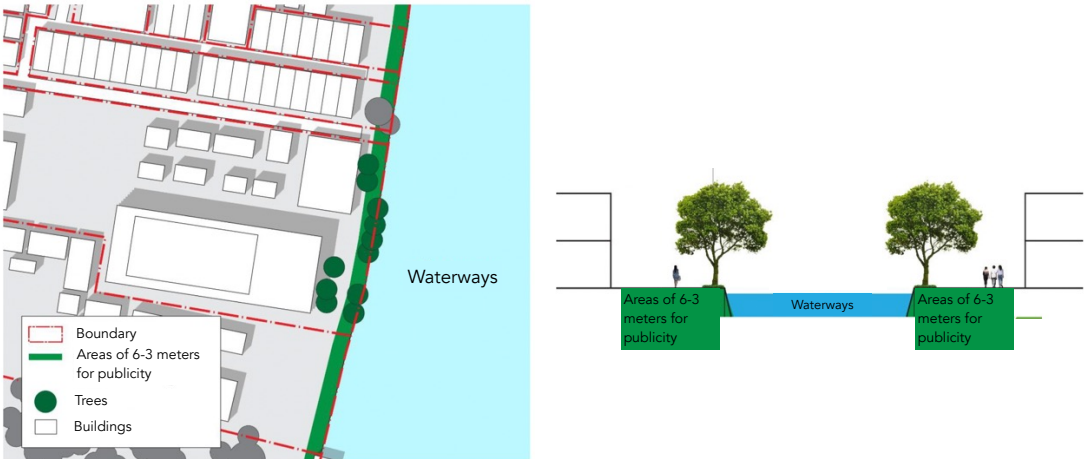
Vision: To restore the Sanseab Canal into a healthy ecological system, innovative wastewater treatment methods and sustainable drainage management will be implemented.
The objective/framework/strategy

1. *Safety water transportation*
2. *Landscape renovation along Sanseab Canal: 2.1 Improving cleanliness and orderliness at area along Sanseab Canal/ 2.2 Improving infrastructure and landscape along the canal…*
3. *Improving water quality*
4. *Improve the illegal encroachment along Sanseab Canal*
5. *Managing water resource: 5.1 Improving water drainage capacity/5.2 clearance the obstruction in the waterways/ 5.3 constructing the water tunnel/ 5.4 constructing the embankment along waterways/ 5.5 advertising and enhancing the information for residents.*

(ONWR, 2021 Page 8)

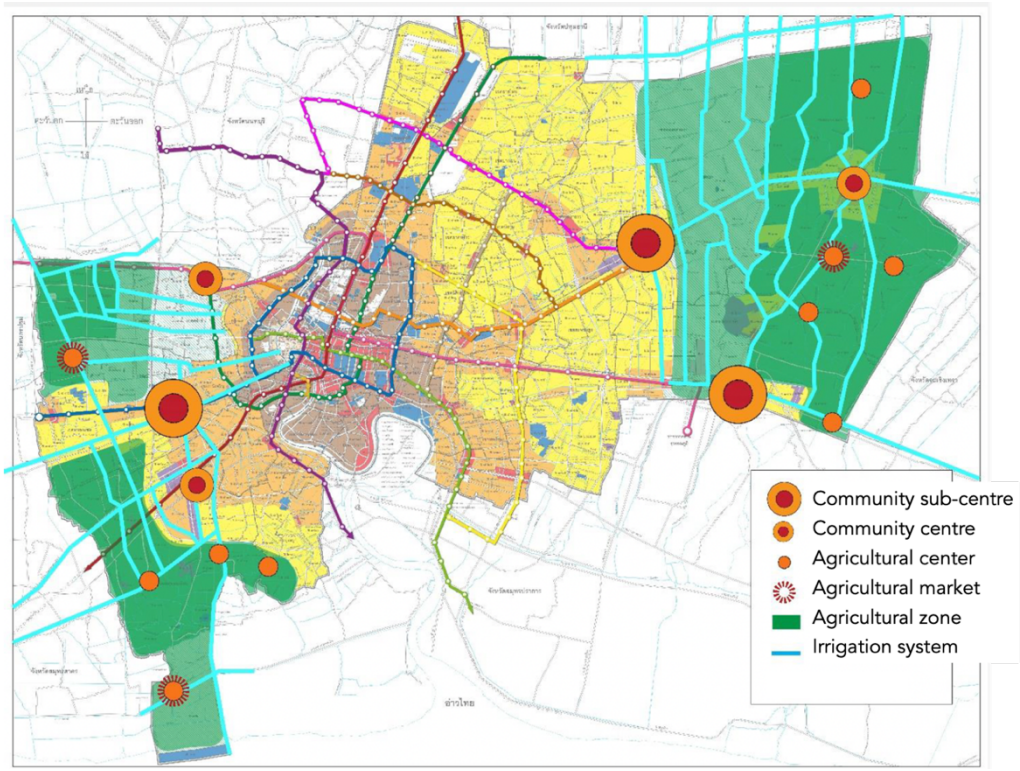
4- The 2020's comprehensive plan (draft) by TPD

"Land located on the edge of BUW with a width of less than 10 meters, there shall be no less than 3 meters of space for planting trees parallel to the edge of the public water source. But if the width of the BUW is 10 meters or more, there shall be no less than 6 meters of space for planting trees parallel to the edge of the BUW." (TPD, 2019 Page 43)



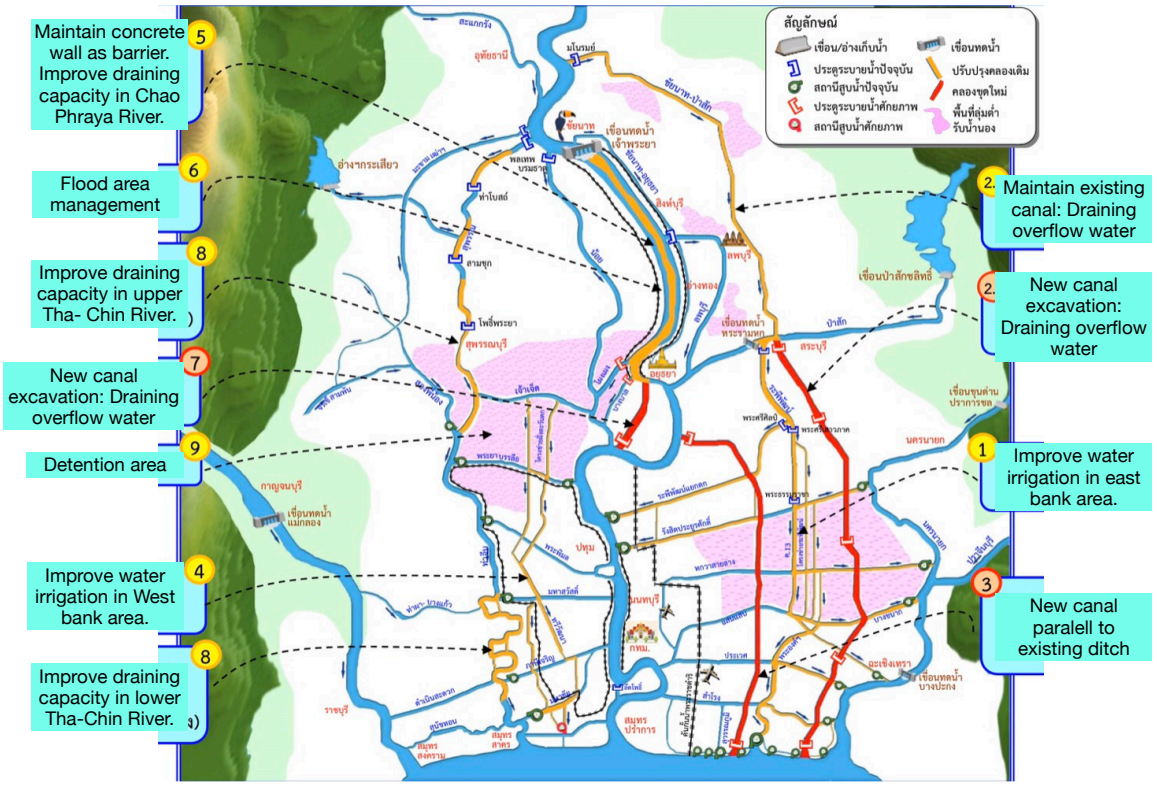
(TPD, 2019 Page 43: Section Agricultural and Environmental)

5- The 2020's comprehensive plan (draft) by TPD : Proposal plan for agricultural section
: Irrigation system proposal (TPD, 2019 Page 35)



6- The OWNR's proposal of flood prevention plan (2020)

Flood prevention management by Office of the National Water Resources
: For Lower Chao Phraya Basin



Source: adapted from
https://www.facebook.com/ThaiDevReport/photos/a.128962947179341/1693106607498290/?type=3
accessed August 2021

B. The example projects along waterways in the conservation zone

1-Phra Sumain public-green riverside Park (FAD, 1999)

A sidewalk and a public park along the Chaophraya River (EP-03/GA-07)



Fig B-1 the Phra Sumain Park located along the Chao Phraya River

Source: https://mgronline.com/travel/detail/9540000143677 accessed March 2021

2-The Khlong Rob Krung Redevelopment Project (TPD, 2017)

: Ong Ang Canal, implemented in 2018-2019

Project aims in 'give the spaces back' to public access, including supporting tourist activities. The water in the waterway has been improved, and the waterway has been reorganized to be commercial, including traditional grocery and street food sellers. Activities including kayak boats provided during tourist seasons (GA-02/04/06/08)

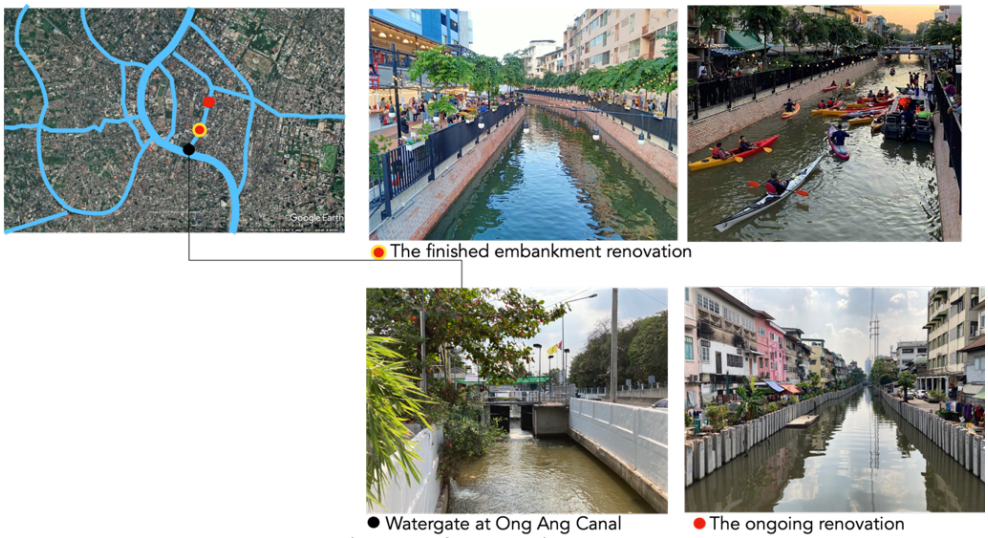


Fig B-2: the Ong Ang Canal Project (Two-Left-Above), the watergates nearby project and the ongoing renovation of the adjacent canals (Two-Left-Below)

Source: https://www.tourismthailand.org/Attraction/ong-ang-walking-street accessed June 2021

3-KudiChin KhlongSan (riverside community) (TPD, 2015)

One of the BMA's heritage district redevelopments to commemorate Bangkok's 250th anniversary (GA-02/06).



Fig B-3: the Kudichin Riverside (Left) design perspective (Middle) the ongoing construction (Right)

Source: UDDC website accessed April 2021 (Middle)

C. The example project during the coup government

Five regenerative projects (BMA,2019)

It contributed by the Bangkok Governor, e.g., Chonnoncee Canal Project. The plan aimed to improve the waterway network and green space in this inner-city neighbourhood. Chong-Noncee Canal, Silom Road, Rama I Road, Limphini Park, and Padung Canal were all part of the total project. The Congnoncee Canal Project aims to assist filter dirty water by employing the plantation and to return the region to public leisure (GA-02/06)

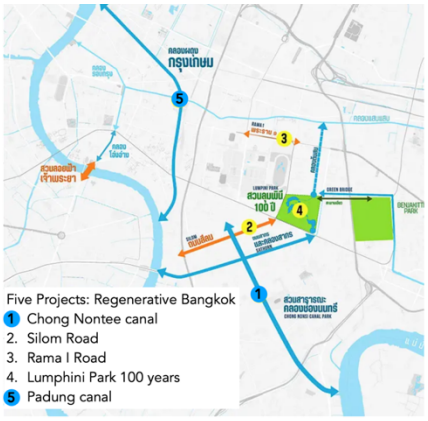


Fig C-1: Map of the five regenerative projects by the Bangkok Governor in 2019
Source: https://thematter.co/brief/158244/158244 access July 2022

Chong Non Cee Canal Project:



Fig C-2: Design perspective of Chongnoncee Project (Left), the implemented site (Middle, Right)
Source: https://www.pressreader.com/thailand/bangkok-post/20211101/282153589499831 accessed July 2022 (Left)

Padungkrungkaseam Canal Project:

Created to provide people with a pathway and a public leisure place (GA-02/06)



Fig C-3: The design perspective of Padungkrungkaseam Project (Left), the implemented and ongoing construction(Middle, Right)
Source: https://mgronline.com/onlinesection/detail/9640000107005 accessed July 2022 (Left)

Boosted the waterway's capacity to numerous canals in Bangkok (DSD&CODI, 2016 until recent (2020)

The project was designed to reorganise the encroached residents along the waterway's bank (Ladprao-Song, Preamphrachakorn, Bang Kean, Samwa, Lad Buakao, Bang Sue, Praweat Burirom, Phrakanong, and Phraya Ratchamonti) (GA-01/04/EP-02)



Fig C-4: (Left) the informal settlement along Ladprao Canal before the project implementation, (Right) the project implementation from DSD and CODI
Source: https://www.matichon.co.th/local/news_324961 accessed July 2023

Chao Phraya For All, riverside public promenade project (PWD, 2015) – not implemented

The street/promenade along the riverbank. Because of the controversy from various stakeholders and the illegal river encroachment proposal, the project was suspended by the Administrative Court of Thailand in 2020 (GA-01/EP-03).



Fig C-5: Proposal of promenade structure with 6-10 meters width encroaching to the River (Left), the alternative of the proposal considering - riverside community- which was not being selected at that time (Right)
Source: https://www.khaosodenglish.com/news/ accessed July 2023

D. The town settlement in relation to water resources in Thailand

The early settlements in Thailand, including **Chiangmai (1290s), Sukothai (1238), and Ayuttaya (1350s),** adopted specific strategies for their locations, each related to water or waterways. For instance, Chiangmai utilised an intermountain basin settlement approach, Sukothai employed a fan terrace settlement strategy, and Ayuttaya chose a river confluence settlement (Fig 4-3 Right). Following a similar approach, Bangkok (1767) situated itself near water resources in a delta settlement strategy. The development of these towns involved reclaiming landscapes around waterways, constructing reservoirs, and/or canalisations, resulting in the creation of waterways. These settlements have persisted through to the present day.

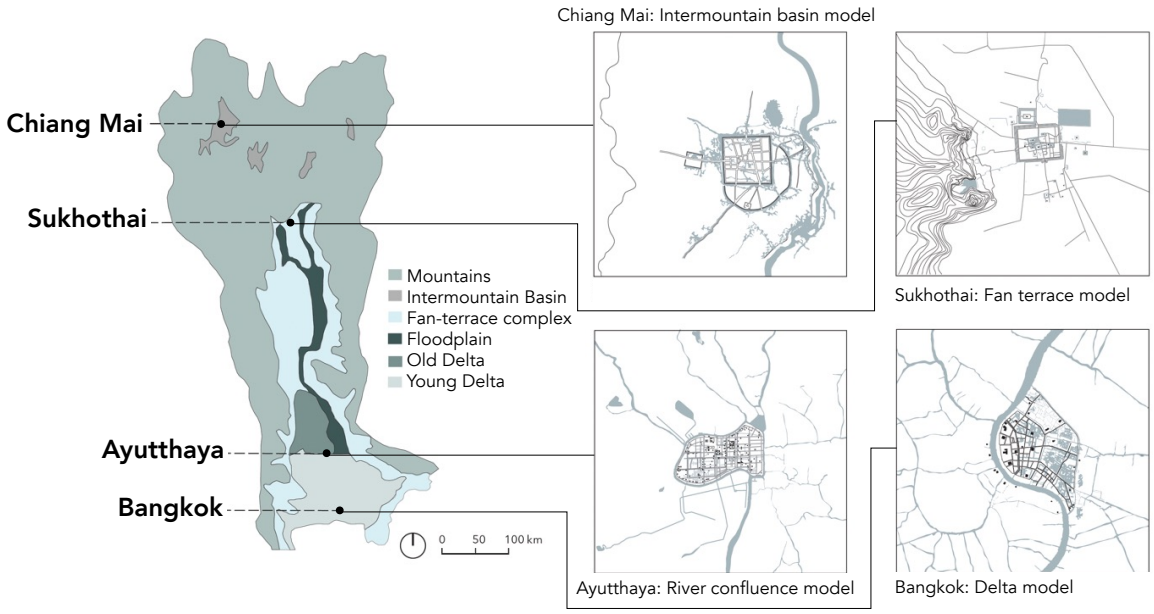


Fig D Historical maps of Thailand: Four towns located nearby water resources with different topography
adapted from Thienvutichai, 2019

E. Historical maps presenting the waterway's pattern



Fig E-1: Historical map, 1887, with pattern of the settlement along the River and the waterways excavated through the agricultural area – explain the different water levels
Source: Thailand National Library, FAD

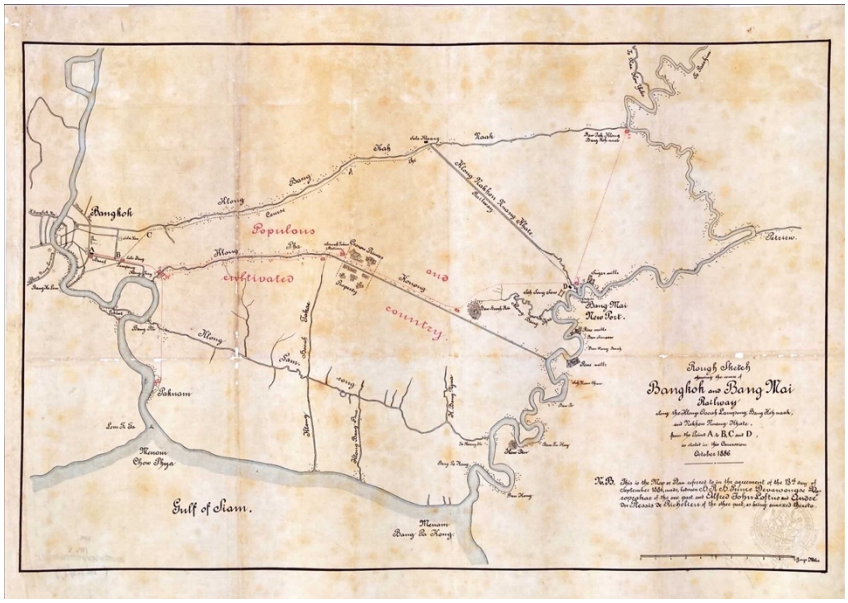


Fig E-2 The historical map in 1886 showing the Sanseab Canal used to be named Khlong Bang Kanak, Source: Thailand National Library, FAD



Fig E-3 Minburi in the overall waterway network and its important location for the lower Chaophraya delta (TPD, 2020)

F. Historical photographs presenting waterways in Bangkok



Fig F-1 Banglampoo Canal during King Rama V, 1860-1910
Source: http://banglamphumuseum.treasury.go.th/news_view.php?nid=275 accessed Aug 2022



Fig F-2 The Sanseab Canal: the market named Mahanak (Left), the small villages at Bangkapi area to eastern Bangkok (Middle) (Pendleton, 1957), The Sanseab Canal and Pechburi Road during 1946 (Right)

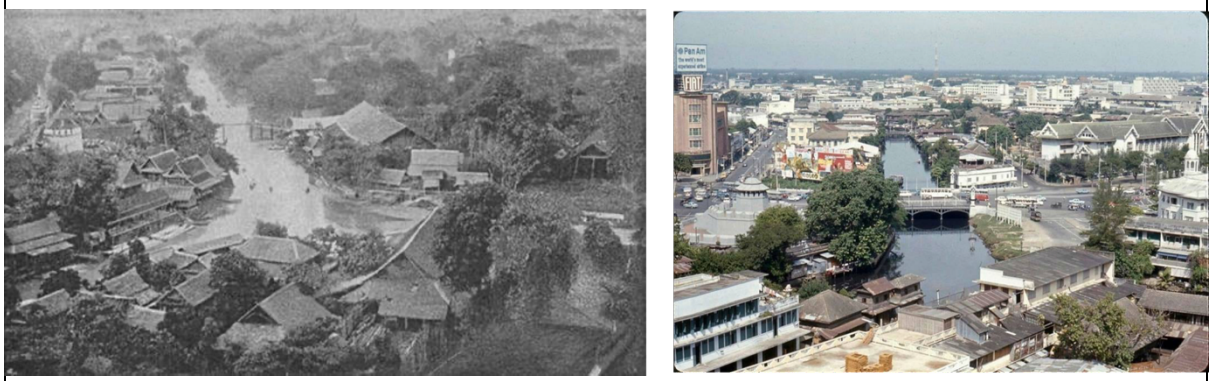
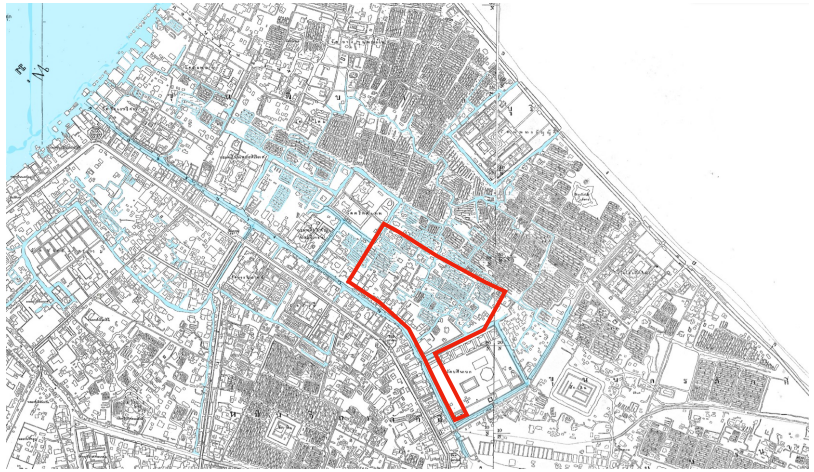


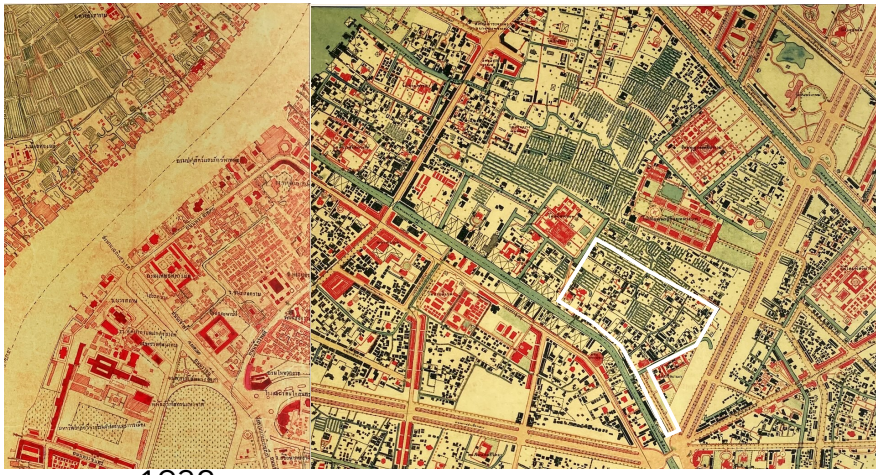
Fig F-3 Mahanak Canal and Banglampoo Canal (Left) the water-base city, (Right) the street-base city (1950s) (Pattarasumunt, 2021)

G. Historical maps (1887, 1932, 1958, 2020) in Banglampoo Area, showing Banpantom Community





1887



1932



1958



2020

0 300 m.

Source: 1887's map (RTS, 1887)/ 1932's maps (RTS, 1901) /1958's map from Australian Historical Archives website, 2020's map from Google Earth accessed July 2022

H. Government's study projects and policy discourse: Banpantom

(Translate into English)

1- Heritage Corridor study plan

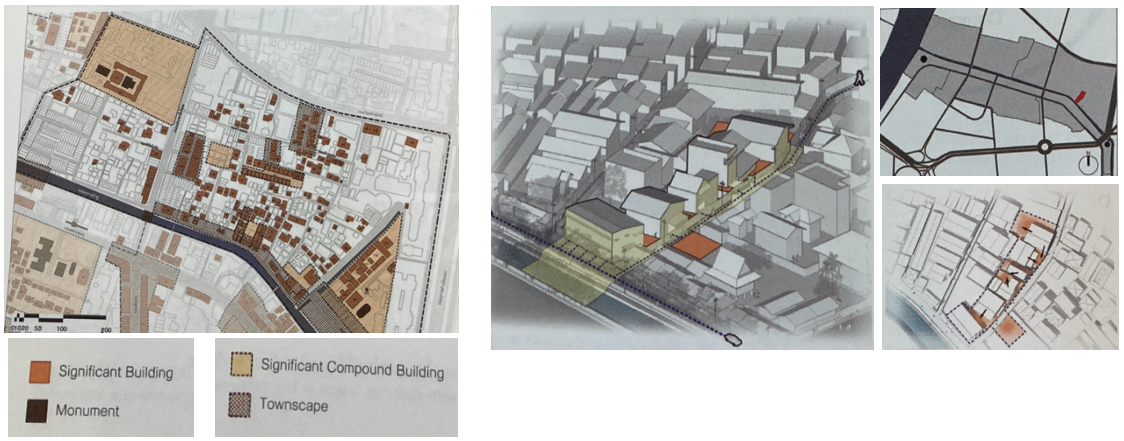


Fig H-1: (Left) The architectural classifying of Banpantom Community, (Right) The proposed orientation of the developed properties in the Banpantom Community (Issarathumnoon, 2016)

2- The Khlong Rob Krung Redevelopment Project



Fig H-2 A Proposal design of Banglampoo Canal at Banpantom community (TPD, 2017)

"…Redevelopment the area adjacent to Banglampoo Canal to facilitate the effectiveness of public walkway's function, Maintain the identity economically of Banpantom Community, reordering the street vendors located along the Banglampoo Canal…"

I. Government's study projects and policy discourse: Minburi Area

(Translate into English)



Fig I-1: The 1997 Minburi study proposal with the administration building cluster (Left), Sections showing the increased depth with stable slope maintaining (Right) (TPD, 1997b)

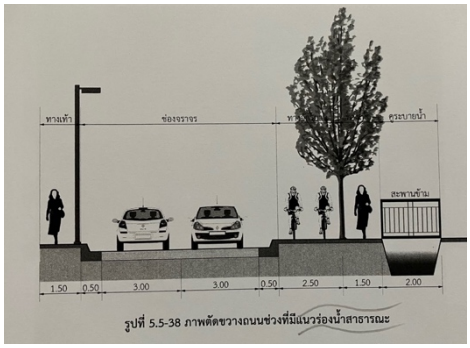


Fig I-2: The 2014 study proposal for the street development showing the open drainage channel (TPD, 2014)

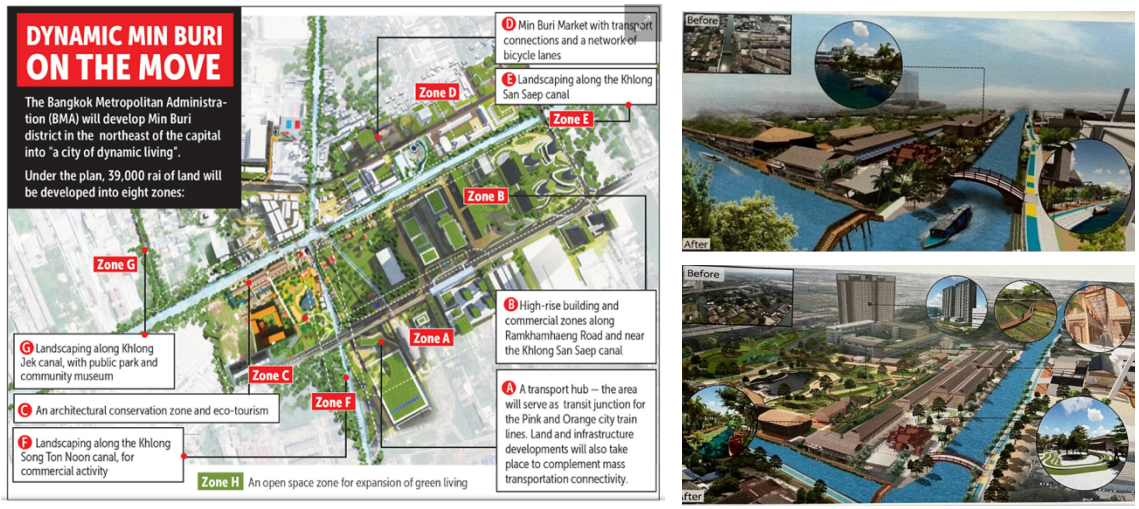


Fig I-3: The 2020 map of the proposal project in the Minburi Area, including Minburi Upatum or Zone C, the community area's perspective from the study proposal (TPD, 2020)

"Zone E: The redevelopment of the area along Sanseab Canal development: 1) Renovate the waterway's bank area to be green recreation space, 2) Develop the waterway's bank and piers to be the efficiency walkway and suppor the transportation, 3) Improve the walkway, bicycle lens, direction sign, and lighting to comport the users"

Zone C: The redevelopment of the heritage architecture to support the eco-tourism: 1) Revitalization of the Minburi Upatum Community and old-market along the Sanseab Canal, 2) Support the eco-tourism along the Sanseab Canal's communities, 3) Improve walkway, direction sign, lighting, to support the universal design and facilitate the tourism route"

An action plan of The Reclamation of Sanseab Canal by ONWR

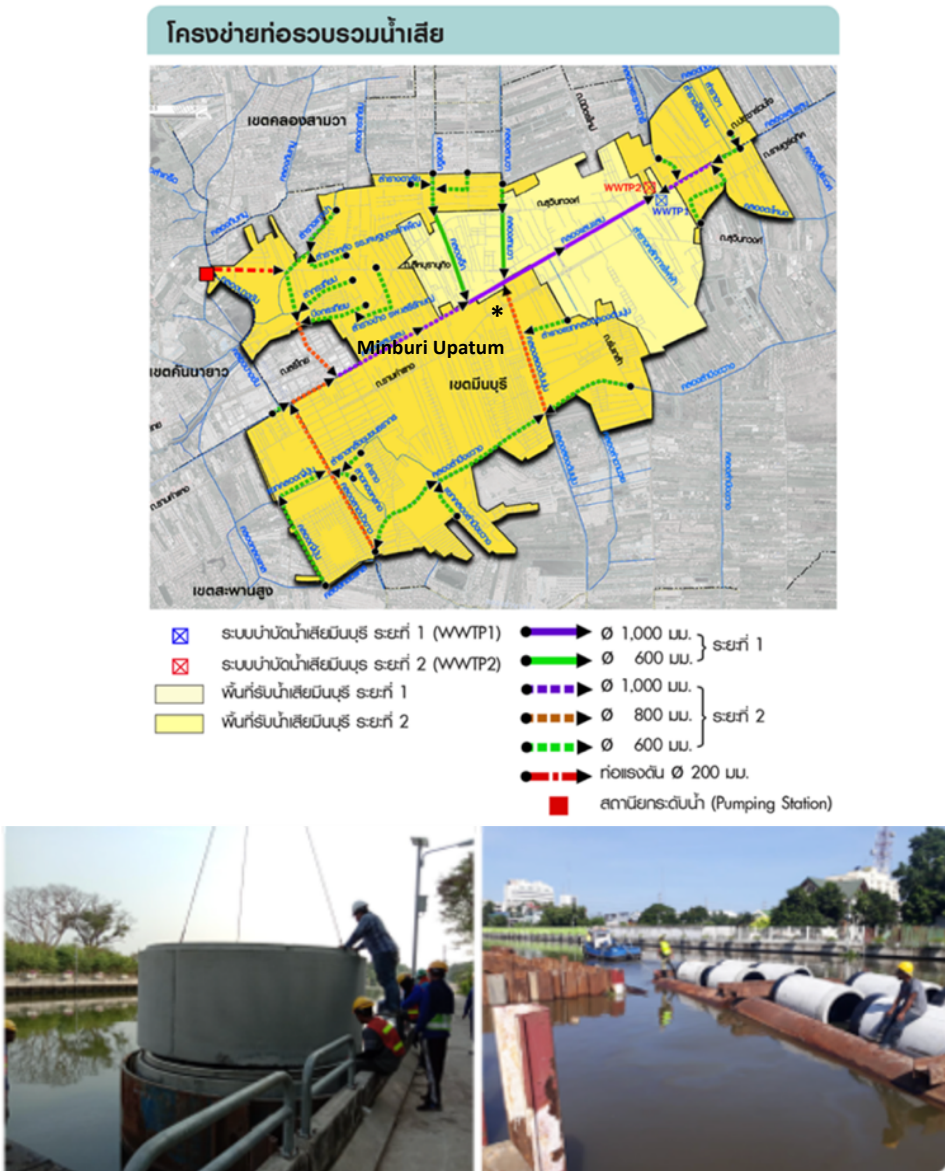


Fig I-4: The proposal map of the public wastewater piping network (Above), the construction of the pipes run through the Sanseab Canal supporting the water treatment piping system (2020) (Below)
Source: https://dds.bangkok.go.th/MWTP/Minburi_Website accessed July 2022

J. Government's study projects and policy discourse: Nongchok Area

(Translate into English)

"The redevelopment of the Nongchok Area will employ the "Green Built" concept, incorporating the agricultural zones on the outskirts of Bangkok. This strategy aims to curtail urban sprawl from the city center while potentially transforming the area into an agricultural hub, thereby fostering economic growth for the future." (TPD, 1997a Page 19)

"…1.4 The preservation of local agricultural area…surrounding the waterways named Lamboryaw Canal, Sib Canal…. benefiting the floodway's. […] 1.5 Objection to preserve the local communities in Nongchok Area…" (TPD, 1997a Page 24)

"The planning of public water transportation involves revitalizing waterways to serve as transportation routes that benefit communities situated alongside canals. These water routes have the potential to facilitate public services, such as garbage collection, in areas where conventional street access is limited or unavailable." (TPD, 1997a Page 37-38)



Fig J-1: The 1997's study proposal of the Nongchok Community with the Sanseab Canal (Left), the study proposal of street in Nongchok Area (TPD, 1997a)



Fig J-2: The study proposal (Left-Above), the implementation (Left-Below), The existing trees and minor waterway (Right-Above), the implementation in 2015 (Right-Below)
Source: http://www.facebook.com/Chim.Sueb accessed July 2022

K. Human settlement of Bangkok

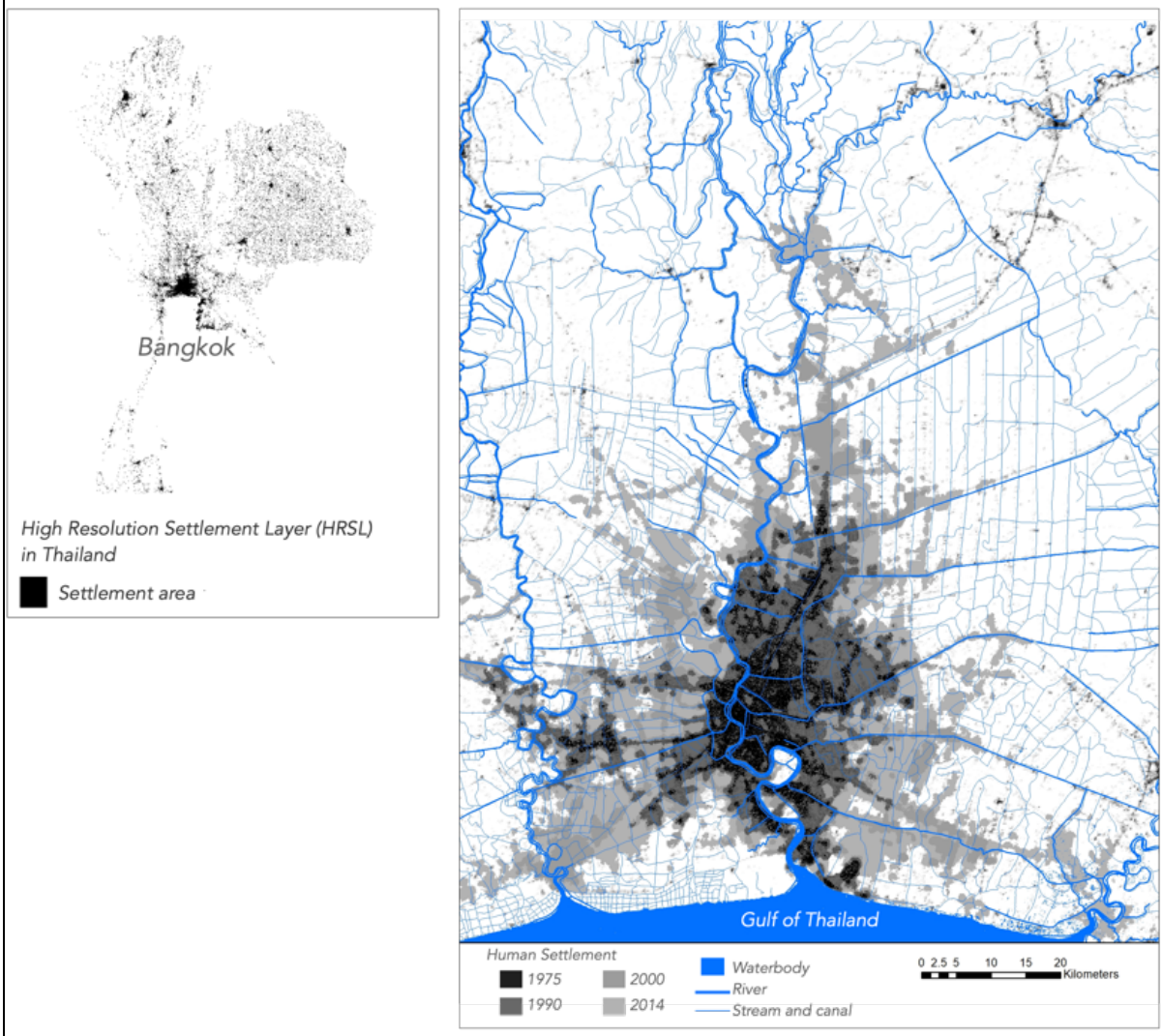


Fig K: A map of the human settlement expansion during the rapid urbanisation (1975-2014), Source: generated from GIS through HRSL and waterway record by RID

L. The 1984 waterways management plan



Fig L: The BUW management plan during 1984 showing the dredging jobs observation (red =dredging, blue= dredged, yellow= no need the dredging job)
Source: Thailand National Library, FAD

Appendix 3 Supplementary research findings

A. The driving force of BUW alteration

Empirical data of BUW's change from stakeholders' description Section 5.2 Chapter 5 together with the historical analysis in Chapter 4, provides four driving forces of change:

(1) Economic condition and industrialisation process
▪ Industrial production in Banpantom Community has replaced the traditional crafting process, eliminating the need to use water for activities (RE-01/02/03).
▪ The economic challenges forced local residents who had become merchants to search for new trade locations after the closure of the Onechart market. This led to an increase in street vendors along the roadway adjacent to the Banglampoo Canal during the 2000s (RE-01/02/04, EP-03).
▪ The neighbourhood began catering to the needs of tourists, shops along Phrasumain Road emerged to serve this demand, causing the Bangalmpoo Canal to become the back of the building instead (EP-03, GA-05/07).
▪ Minburi Area, Economic conditions made traditional trading and rice milling unprofitable, leading to the abandonment of large rice mills along the Sanseab Canal (RE-05, EP-03).
▪ In Talad Nongchok, the wooden mill stopped importing wood through water transport; the expensive wooden planks and the availability of alternative materials were amongst the causes. Owners have adopted artificial wood and built a street over the minor waterway for factory and new townhouse access (RE-08).
(2) Land management
Banpantom
▪ The Phrachatipathai Street and Onechart Bridge construction was mentioned as the factor causing the loss function of the Banglampoo Canal (RE-01/02/03/04).
▪ The permanent watergate at the canal's mouth kept the water level consistently low until the water became of poor quality during the dry season (RE-01/02/03/04).
▪ The roadway construction along the bank with the fence rendered the area inaccessible to the waterway (RE-02/03).
▪ The reordering management was mentioned as having improved the clean area at the roadway along the canal, which once used to attract street vendors (RE-01, EP-03).
Minburi Upatum
▪ Streets construction of Ramkhamkheng, Sukaphipansam, Romkao, leading to little ongoing function for the Sanseab Canal (RE-05/06).
▪ The Governor's policy, by Dr. Phijid and followed by Mr. Samak, known as 'the Paradis Bangkok' aimed to construct embankments along all waterways in Bangkok to create a tidy appearance and support walkways to connect other transportation routes (RE-06, EP-03). The embankment resulted in the disconnection of a minor waterway in the community, leading to a decline in water quality (RE-05/06/07).
▪ Management practices were cited as contributing to the impacts of flooding in the northern part of the Sanseab Canal, as water in the waterways was prevented from flowing south to Bangkok. These blocked waterways have caused those areas impact from flood to their farmland instead (EP-02/04)
▪ The impact of flooding in Minburi due to the water levels in the canal to the east prevented flow to the city centre (RE-07).

Talad Nongchok
▪ The administration implemented a high embankment flood dike, it caused a significant change in the waterway, as the natural banks disappeared (RE-08/09/10).
▪ The deed registration during the reign of King Rama V determining the rights to occupy the areas along the waterway. The waterway's bank must not registered as individual property (RE-08/09, EP-09/10).
▪ The management of the watergate and pumping station at the Sanseab Canal at the eastern part also led to poor water quality and changes in water flow (EP-09).
(3) Land use change and urban densification
▪ Immigrant from urbanisation disposed of trash and waste directly into the urban waterways. ▪ increase in built-up areas to accommodate urban needs has obstructed the waterway network, preventing proper water flow. The transformation of green and retention areas into urban functions has significantly reduced rainwater absorption capacity. ▪ The altered waterway network no longer functions as efficiently because of disconnections and the higher priority of other urban functions (EP-04).
▪ The area along the Banglampoo Canal was once considered dangerous due to illegal activities, as the waterway's vicinity was neglected and poorly regulated (RE-02/03). This was a result of the denser neighbourhood and changes in land use within the district, transforming into a shopping destination and a popular spot for teenagers to gather, leading to a diverse mix of people (EP-09/03).
▪ In Minburi Upatum, the market was shut down and relocated to Singhaburanakit Street with a new layout, investors, and different groups of merchants (RE-05/06). The conversion of various land uses – housing estates, streets, parking lots, and new commercial areas – led to wastewater being directed into the Sanseab Canal (EP-10).
▪ In Nongchok Area, real estate projects emerged due to changes in land use. These constructions often covered the existing minor waterways previously used for irrigation purposes in the area (EP-04). Unfortunately, the new urban function did not provide a separated water treatment system, resulting in alterations to the waterways in the neighbourhood (RE-08/EP-09).
▪ Investment for new functions in the area also led to the demise of Pah Sakea Community, which was previously situated along the Sanseab Canal, opposite Talad Nongchok. The area has now been transformed into parking lots serving the customers of nearby apartments (EP-09).
(4) Way of living
▪ The introduction of non-local species such as Nile Fish through this traditional activity (release animals) negatively impacts the waterways' ecosystem through the release of non-native species of aquatic animals into the waterways (EP-06), which is part of Thai Buddhist culture.
▪ The demand for the craft kitchenware which used to collect betels declined (RE-03). The use of betel, which used to be common behaviour amongst Thais was prohibited, leading to the discontinuation of its production (RE-01/02). Since the process of making this kitchenware required water, it was eventually abandoned.
▪ In Minburi Upatum, a grocery market that operated along the waterway had to be closed down for a multitude of reasons, including the dwindling number of customers. The local merchants could no longer sustain their business as people increasingly preferred to shop at supermarkets (RE-05/06).
▪ in Talad Nongchok, the locals moved away from and opted not to continue their families' trading businesses (RE-08/09). The changing lifestyle choices of the residents played a role in this shift in loss of cultural identity of this local market.

B. Additional examples/quotations in BUW government performance

(Section 5.3 Chapter 5)

5.3.1 Collaboration versus fragmentation
▪ *"When the PWD planned street construction, they normally overlooked existing water flow, indicating a lack of communication with the water management team [DSD], as it's beyond their jurisdiction." EP-03*
▪ *"Routine tasks like waterway dredging are carried out concurrently by RID, MAD, and DSD, each with distinct aims. The RID focuses on enhancing irrigation, the MAD on easing transportation, and the DSD on enhancing drainage capacity. The waterway dredging-related tasks were needlessly duplicated in the pursuit of distinct objectives, resulting in unnecessary budget allocation." GA-01*
▪ *"One day the LED came here and told us that they will provide the tents to us. […] Another two days later, DIO said that we must move away… in order to clear the area [along Banglampoo Canal] to be neater." RE-01*
▪ *"MAD have constructed the piers along the riverbank in The Old Town Bangkok without obtaining the FAD's prior approval" GA-08*
5.3.2 Informative communication
▪ *"During meetings, junior staffs often seek the opinions of their senior colleagues. However, instead of engaging in critical discussions, the seniors tend to remain silent. People in higher positions often avoid speaking up during meetings to steer clear of conflicts or unfavorable perceptions from their superiors." EP-03*
▪ *"We (FAD) engage in various meetings where authorities present their projects to us and other agencies. This typically happens in the final stages, just before the project receives approval for implementation. In these meetings, we are provided with the finalised solution, and no alterations can be made." GA-07*
5.3.3 Centralised power, political time frame and bribery
▪ *"Projects receive directives from the Governor often flow through the DSD and PWD due to their capacity and manpower to implement projects. These projects tend to progress more quickly and efficiently owing to the Governor's power to allocate budgets and can operate independently from existing overarching policies of the agencies. Projects stemming from Comprehensive Plans tend to be more limited in occurrence." GA-06*
▪ *"During that period (2014), the policy set by the Military Government facilitated the rapid removal of the encroached settlements along Ladprao Canal. The BMA had been considering this project for the past decade, conducting extensive research, yet they hadn't taken steps to implement it. But it has now- because of the Military Government" GA-05*
▪ *"…The typical procedure involves sending a letter to the FAD's General Director for project approval, such as those [the projects] in the conservation zone around the historical canals. […] Certain projects, like the Ong Ang canal, I believe it approved by our leader [FAD's] due to a command from the PM, making them eligible for fast-tracks. Otherwise, such projects normally undergo standard processing of various committees [in FAD]." GA-07*
▪ *"Corruption and bribery normally occur in constructions project, such as the construction of river dikes and embankments along the canals. This normally makes a lot of money." GA-01*
5.3.4 Lack of autonomy
▪ *"The recent process of having the DIO is too weak as they came from the appointed or the favor by the Governor. Residents cannot have the influence over the DIO. They [DIO] do not have the power or the right to make the decision such as the budget. They just become the representative of the residents with no power. Mostly, GA staffs become to this position [DIO] to gain an opportunity to level up to be the city councillor." EP-05*

5.3.5 Meaning in residents' engagement
▪ *"…discussions [in participation process of Minburi Project]… often went off-topic and residents were hesitant to express their genuine objections. The timeframe was too short. The final plan essentially excluded residents' opinions, as they were deemed less helpful to the overarching TPD's policy objective and seen as potential obstacles to project implementation." EP-03*
▪ *"In theory, the participation process includes wider stakeholders following TOR. If the projects relate directly to communities, the authority should write TOR neatly to process participation. […] The scope of work of Minburi Project was big. We had to invite the border stakeholders, so the participation did not following our expectation. […] The authority [TPD] also aimed to launch the most possibility project, so they prevented every conflict that might happen from the residents' opinions." EP-01*
▪ *"The DSD informed out leader to relay the message to us about the need to demolish structures along the Sanseab Canal bank [for the embankment construction]. This directive was influenced by the fact that the landowner of [Minburi Upatum] is NOB, granting the DSD permission to carry out the construction. […] We were not in their involvement." RE-05.*
▪ *"…they [GA] did call our [community] leader to receive their proposed project to construct this structure in the Sanseab Canal [the wastewater treatment pipe]." RE-07*
▪ *"They [GA] do process the project without asking our opinion rather just inform what are they going to do. They never did the participation, public hearing, or came to fieldwork here. They did it from their office within the paper without considering or rechecking from the real site. […] I remember that they used to say they was doing the construction plan from the satellite map. Then, that's why the structure height isn't proper to the real elevation. They never come to measure the elevation or see the condition of the residential here before the construction. They said that they did the same typical and standard to the embankment in the inner area of Bangkok, but here is different." RE-10*
▪ *"The current wastewater treatment project, the DSD initiated substantial construction without involving the residents in process. This infrastructure is not objected to service the locals' properties because they are not the landowners." EP-03*
▪ *"They [GA] have already made the decision before letting us or community leader known. Therefore, we have to agree with them, but I don't know whether we be able to not agreeing with them. […] They [GA] did talk to the leader to inform their project to construct this structure [of treatment piping in Sanseab Canal] despite it did not connect to our wastewater piping in the [Minburi Upatum] community." RE-07*
▪ *" Office of the National Anti-Corruption Commission [NACC] and State Audit Office of the Kingdom of Thailand [SAO] conducted an investigation on the damaged embankment [in Talad Nongchok], but there were no outcomes. It took three years for them [NACC, SAO] to initiate the investigation. They came, discussed the matter, and left without any changes. Throughout these three years, we engaged with numerous GA staffs. They repeatedly requested documents for our appeal. Despite providing the documents, they asked for them again." RE-09*
5.3.6 Lack research into implementation
▪ *"The implementation of Khlong Rob Krung was carried out different from the research plan [by the Chulalongkorn University]. The implementation focus is on clearing encroachments and developing tourist attractions along the canal, involving reorganising street vendors along waterway." RE-01*
▪ *"The winning companies or agencies to do the government's project, their proposal does not always translate into implementation. […] A clear illustration of such can be seen in the case of the Nongchok Redevelopment Project in 2014 by Chulalongkorn University, where the winning proposal was ignored." EP-08*
▪ *"If the project is urgent or under the leader [Governor] consideration, the project can be fast-tracked to implement it without the need for a lengthy research process." GA-06*

5.3.7 Data limitation in decision-making
▪ *"They [DSD] didn't measure or inspect our houses' conditions before building the embankment. They applied the same typical of construction as the canal named Khlong Simsam. They was claiming that our houses are in the low level, which is inaccurate because we have never experienced flooding. […] We've repeatedly requested to see their construction plan, that outlines why the embankment should be such a specific height, but they [DSD] have consistently refused to provide it." RE-09*
5.3.8 Different agency's interest and limited knowledge
▪ *"… with each iteration of Comprehensive Plans, the associated plan often leads to increased street construction, repeating renovation the same sites, relegating water as drainage considerations to replacing water pipes underground, while existing waterways are overlooked". EP-03*
▪ *"…The Public Work Department picked some action plans in the TPD's policy to implement. They will never improve anything without rebuilt and replace the footpath again and again, change the material of the road from concrete to be concrete stamped, or re-line the underground electric line."RE-02*
▪ *"The urban plans are all about land-use and color code. This is socio-economic with not exactly the social dimension considering the historical settlement of Thais social. The color code is about the economic with little of social aspect. This plan separates the area with single use. But in our Bangkok's context, there are always communities in every waterway, while the plan coded the colour with just a colour. […] This plan is the approach from engineers only. When they [GA] dictated, such as, floodway zone, the residents who lived in that area become unlucky" EP-02*
▪ *"In the Bangkok Resilient Strategy, 2017, [Rockefeller Foundation], when considering a flood prevention plan, decision-making falls under the DSD, and area renovation is managed by the PWD. The dominance of agency-centric decision-making is notable and cannot translate tasks from this policy to implementation." EP-03*
▪ *"The DSD, responsible for water management, predominantly emphasises drainage. However, comprehensive water management involves maintaining water quality in waterways and adapting areas to store water, tasks that the DSD does not effectively perform." EP-06*
5.3.10 Insufficient regulation enforcement
▪ *"The Comprehensive Plans and BMR plan prioritise economic benefits and industrial development over strict land use regulations, allowing for potential growth but hinders effective flood control measures. The plans lack stringent enforcement, resulting in the expansion of residential areas into flood-prone zones, compromising the efficiency of flood prevention measures like the polder system [King Dike]." EP-03*
▪ *"The projects involving BUW concerning embankment construction for erosion or flood protection by DSD are considered unalterable. Any modification to BUW would necessitate agencies to engage in an intricate process to determine responsibility. There are less chance to opening the discussion." GA-01*
▪ *"There is a budget for water transportation allocated on an annual basis but the action never be effective. This budget falls short when it comes to improving water quality and developing supplementary facilities to support water transportation, such as piers and walkways." GA-02/07*
▪ *"The historical canals continue to serve as drainage channels, supporting overall drainage efforts, although they were registered as the protected monuments under FAD's regulations. […] The only noticeable recognition of these historical waterways is the choice of design material decorating the embankment, when the FAD's regulation seems to have no relevance." EP-04*

▪ *"Informal settlements frequently threw garbage in the canals due to the absence of garbage collection services, or the disposal areas reach full capacity. No fines or other regulation prohibit these activities" EP-04*
▪ *"We [RC-ONEP] cannot accept or decline any proposed projects within the conservation zone. Our role is limited to the suggestion of whether something should or should not be done." GA-05*

C. Additional examples/quotations in schemes of desirable change

(Section 5.4 Chapter 5)

(2) Increasing detention area
"We used to convince to have the [detention area improvement] regulation in the Comprehensive Plans. The construction of building should have the detention pond/area in their property or have the area where the water can flow through. […] We used to have the pocket parks plans, proposing for linear areas along waterway, but we couldn't develope it." GA-06
(4) Improving wastewater treatment
"The government must seriously enforce the wastewater treatment from; the housing estates, the department stores, the restaurants, buildings located nearby the canals, and buildings which have to lead their wastewater to the canal. The government should investigate and have the strong measure to control their wastewater treatment." EP-04
"We proposed a plan to enhance the wastewater system by developing the canal-side footpath with the structure underneath; however, this happened only some of areas. This involves channelling wastewater from residential areas into pipelines beneath the footpath along the canal. The wastewater would then be redirected to a treatment station before releasing clean water back into the canal. Technically, this typical should be all along the waterways in Bangkok." GA-06
(5) Improving garbage collection
This should begin with the establishment of sufficient covered of garbage collection points within the communities. The authorities should then ensure systematic and regular collection of garbage, either on a daily or weekly basis." EP-06
"They [GA] should build the awareness [of garbage disposal] to the residents. The schools could be the most important agency to start." EP-04
(6) Restoring waterflow and network
"The possibility of Nongchok neighborhood in the future will depend on the surrounding network of BUW in this area, not the area itself. […] We must understand how much of the capacity of these waterways' networks can work? No just one waterway will help the city. […] I propose the systematic approach, I see more than one area or a spot..." EP-02
"We should restore the small waterways. […] The waterways network will prevent the flood impact because the waterflow will get through the network rather flood the urban. The waterway is 'critical infrastructure' that is the important elements can help the city to survive during the uncertain change. […] There are a lot of small waterways that jointed to the main waterways. If you want to restore the BUW network, the important elements will be the minor one." EP-02
"The restoration of the water flow system can be an underground structure if the area is already occupied with the critical function, such as streets. This means the waterflow system still propose to come back although the physical is not the same." IA-08
(7) Restoring waterway banks
"The plant is a very important factor in bringing the cycle system of natural waterways context. The most important thing is the food chain. The bank, then, becomes the most important location to restore. This is because the plant can grow and the animals can stay around them, lay eggs, hide for the enemy, and be food for them. […] When the system of plants becomes better and stronger, the fish's eggs can hang on them and survive. This will be the beginning of the improvement." EP-06

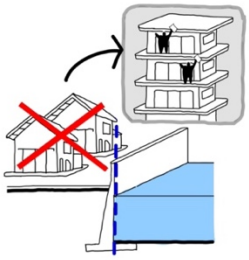
"The only way to maintain this area is to build the forest at the bank of the river instead of the engineering structure. […] We rather planted more mangrove trees along the riverside by adding the sediment soil. As this process, we do need to open the waterways to connect with the river to let the rate of the water not too fast or too slow, the water would bring the sediment to add up at the bank naturally." EP-03
(9) Enabling access for routine consumption
"There are lots of us want to access the water like before the construction, but they [GA] ignored to do such as pier for us. This railing has been too high to use any boat or fishing comfortably. […] In fact, I was thinking that it might be good if there will be the terraces or piers where we will get access to the waterbody." RE-07
(10) Equilibrating the operation of watergates
"I think if the government allowed the gate to frequently open from the river, it would help. During the dry seasons, the water level [in Banglampoo Canal] would have not dropped too low. […] Allowing water to flow in at times would be beneficial." RE-04
"…during the flooding in Minburi, if they [GA] had opened the gate to allow the water to flow to the Bangkapi Area, both Minburi and Bangkapi would have had similar water levels and might not have flooded, or at least the impact would have been significantly reduced." RE-07
(12) Floodable land use at the waterway edge
"The authority should provide the law or regulation for housing settled in the floodplain area to renovate their houses as elevated floors, relying on the heritage consideration. […] The government could provide the money or any benefit to them according to the renovation of the houses, such as tax reduction, flood insurance, and risk assessment must be established." EP-01

D. Annotation for 16 schemes of BUW desirable change

(1)	Determine the distinct and easily defined boundaries of BUW and the surrounding areas by transferring ownership of waterways to the public. Enhance the efficiency of the spatial relocation policy to move individuals residing on the banks of BUW to the suitable alternative locations.
(2)	Discover additional detention areas within the urban environment to assist in absorbing rainwater in developed areas. This, coupled BUW, aid in managing rainfall in the urban setting.
(3)	Enlarge the pipe's diameter to accommodate a greater water flow. Enhance the quality of dams, embankments, water gates, and pumps. Utilize increased pumping capacity to redirect water from the protected area. Raise the embankment height to provide additional space for water volume and enhance area protection.
(4)	Enhance wastewater treatment by segregating the pipe systems for rainwater and wastewater. Prohibit the direct discharge of wastewater into the BUW.
(5)	Employ small vehicles and manpower, to effectively gather trash in the narrow alleys alongside the BUW. Extend the collection schedule, introduce additional disposal points, and establish more routes for surface-level trash collection on the BUW.
(6)	Studying the flow of the BUW network and restoring the flow which have been fragmented and be relevant to the overall scale. Improving the functions of open channels and the surface drain capacity.
(7)	Restoring the bank of BUW by making a stable slope and improving the dredging annually. Considering the significance of waterway's bank or edge as an ecological significance.
(8)	Permitting individuals to reside or sustain their livelihood along the BUW, including the authorisation for vending and negotiating their rights to occupy their current settlements.
(9)	Ensure accessibility through features like docks and stairs, enabling people to utilise the waterbody for daily activities such as obtaining water, irrigating plants, cleaning tools, fishing, and utilising local boats.
(10)	Operate or unlock the water gates to allow water to flow during heavy rainfall, avoiding closure to prevent specific areas from experiencing elevated water levels while keeping other areas dry. Ensure a continuous water flow to prevent water pollution when the water level remains too low or stagnant.
(11)	Administer the BUW vicinity with improved lighting and CCTV installations. Clearly outline the areas nearby private houses to enhance the privacy of these residences.
(12)	Recognise the BUW-adjacent area as flood-prone, permitting water overflow to the banks. Simultaneously, explore opportunities for alternative functions by occupying an elevated architecture or structures in these areas.
(13)	Offer special attention to specific areas by taking into account their identity, local characteristics, history, dynamics, and functions. Keep these factors, local identity, in consideration when contemplating any contributions to these areas.
(14)	Introduce additional routes and services for boats as a means of public transportation.
(15)	Enhance the regions alongside the BUW to serve as recreational areas with public access. Modify the typical embankment design to better suit the function of recreational spaces.
(16)	Engage investors in developing the functionalities along the BUW for efficient utilisation.

(1) Boundary control and relocation improvements
(2) Increasing detention areas
(3) Improving structure capacity
(4) Improving wastewater treatment
(5) Improving garbage collection
(6) Restoring waterflow and network
(7) Restoring waterway bank
(8) Granting permission to inhabit and earn a livelihood
(9) Enabling access for routine consumption
(10) Equilibrating the operation of watergates
(11) Providing safety and security
(12) Floodable land use at the waterway edge
(13) Considering heritage or areas identity
(14) Emphasis on public water transportation
(15) Providing recreational public access
(16) Involving investors and developers

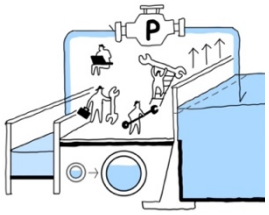
The 16 cards representing 16 schemes



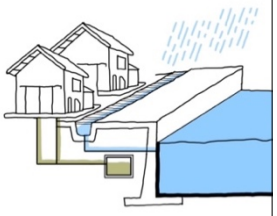
(1)
Boundary control and relocation improvement



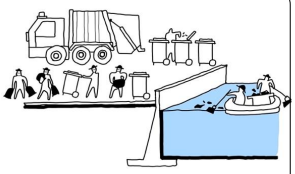
(2)
Increasing detention areas



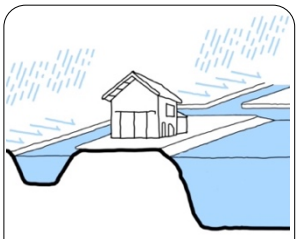
(3)
Improving structure capacity



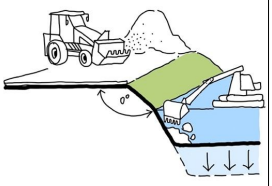
(4) Improving wastewater treatment



(5)
Improving Garbage collection



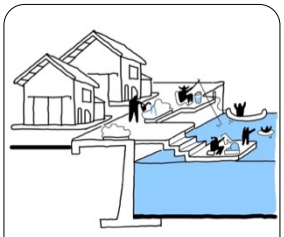
(6)
Restoring water flow and network



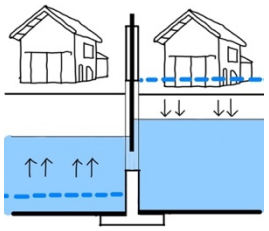
(7)
Restoring the waterway bank



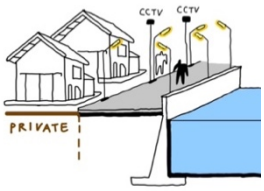
(8) Granting permission to inhabit and earn a livelihood



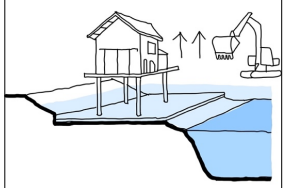
(9) Enabling access for routine consumption



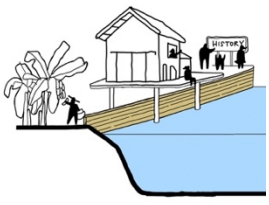
(10) Equilibrating the operation of watergates



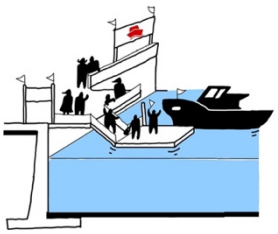
(11) Providing safety and security



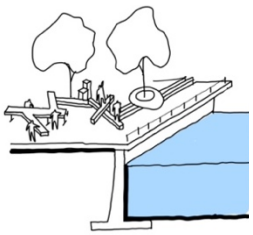
(12) Floodable land use at the waterway edge



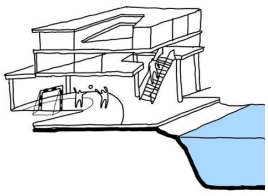
(13) Considering heritage or area identity



(14) Emphasis on public water transportation

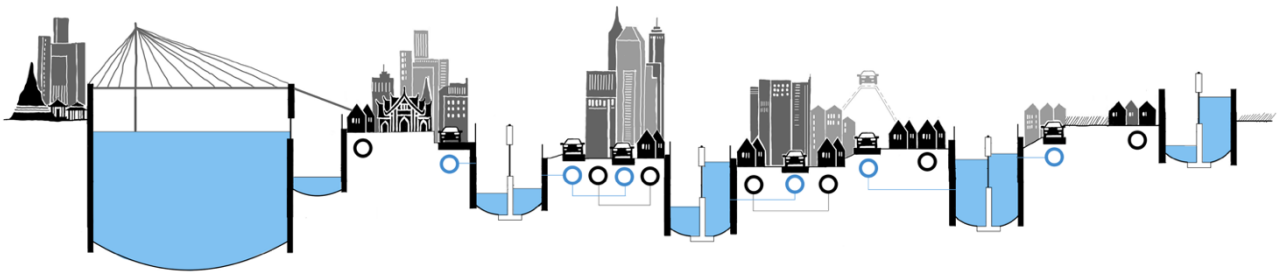


(15) Providing recreational public access

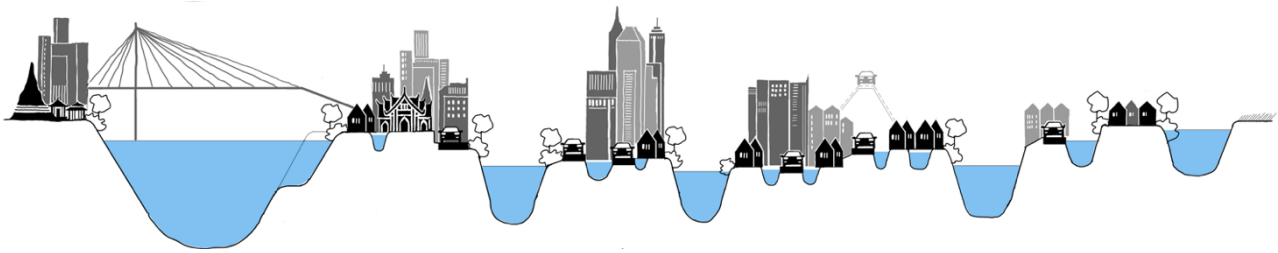


(16) Involving investors and developers

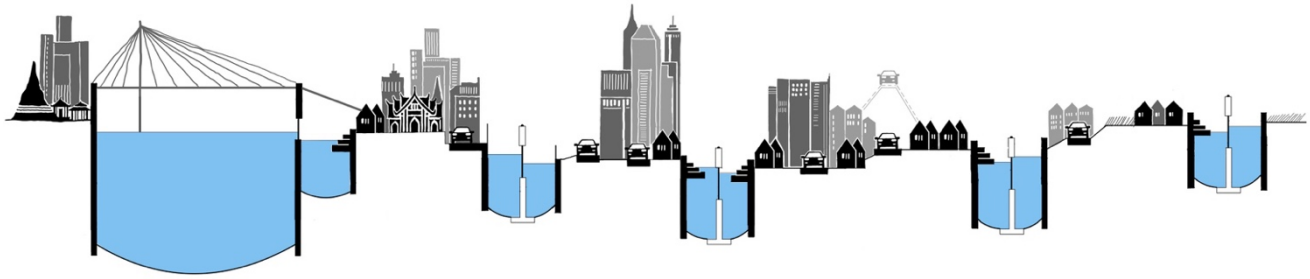
E. Five scenarios of future change of BUW: The eastern Bangkok



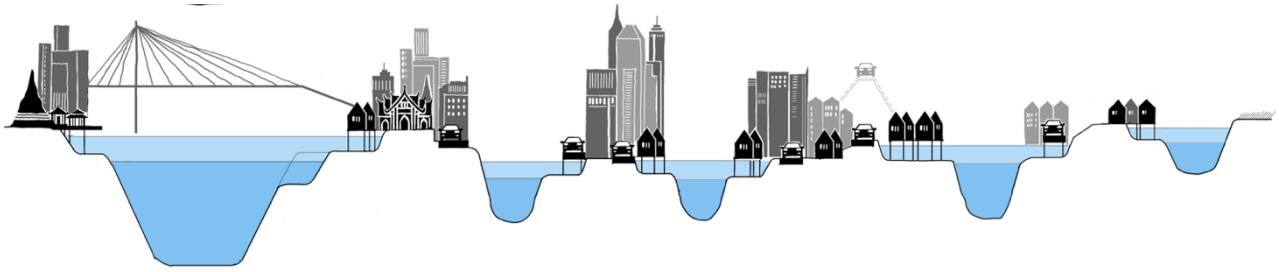
Scenario I: Enhanced ongoing management



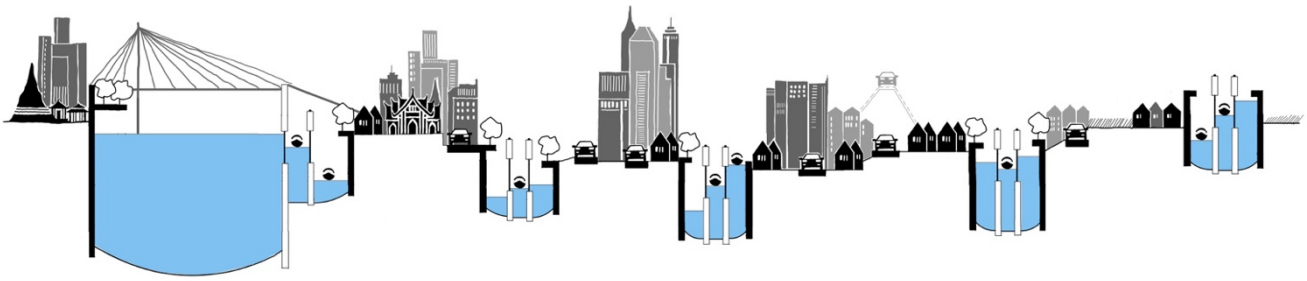
Scenario II: Natural restoration



Scenario III: Prioritising benefits for locals

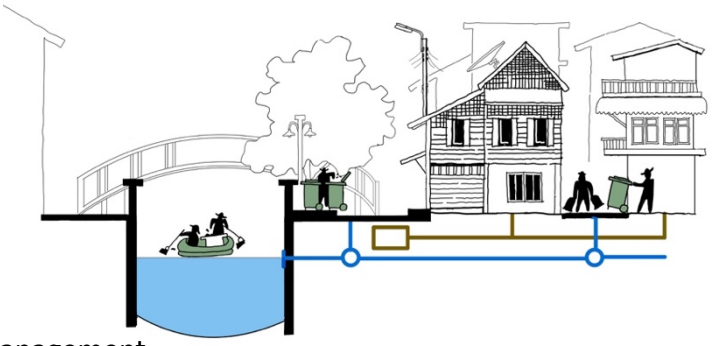


Scenario IV: Floodable land use with heritage consideration

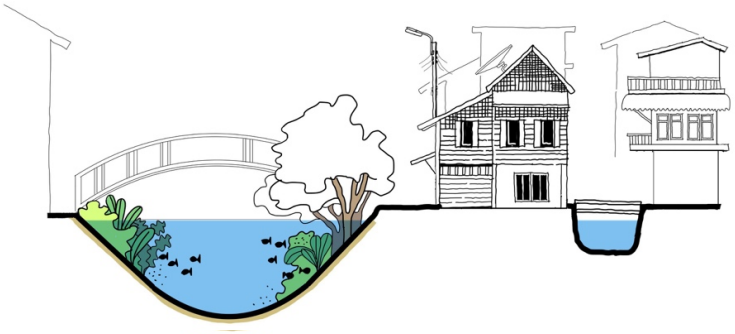


Scenario V: Highlight urban functionality

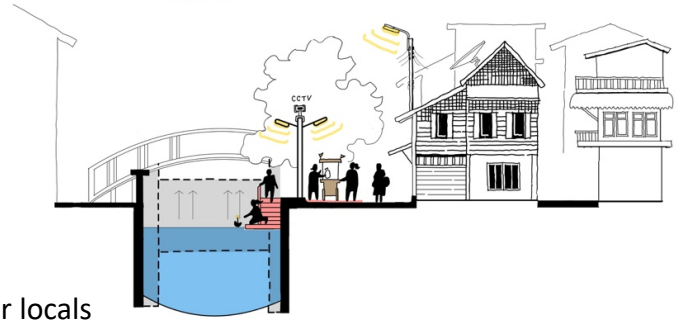
Five scenarios of future landscape change: Banpantom CO-01



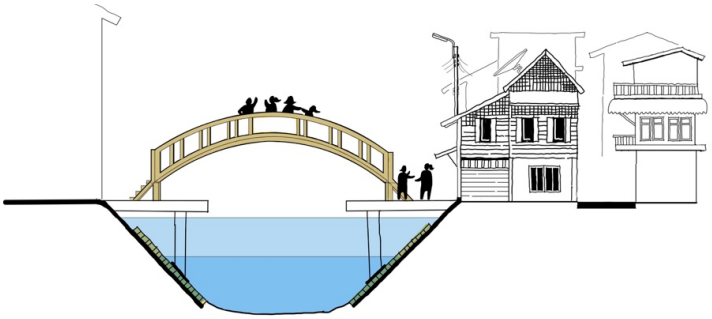
Scenario I: Enhanced ongoing management



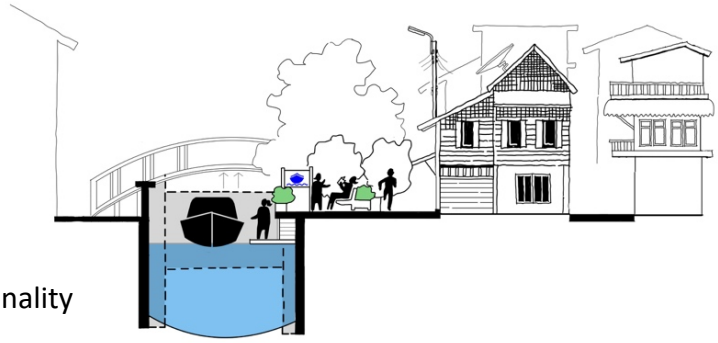
Scenario II: Natural restoration



Scenario III: Prioritising benefits for locals

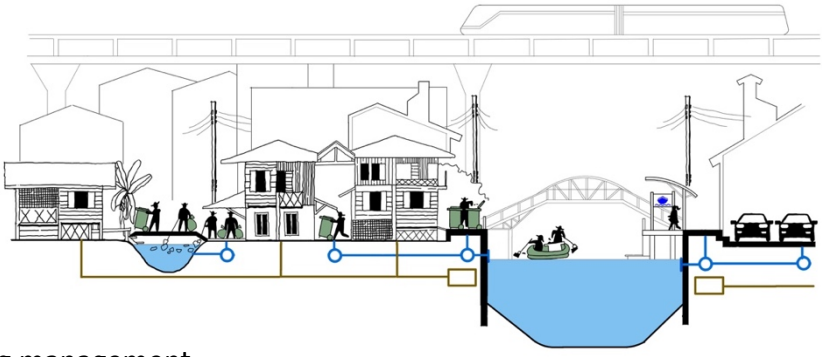


Scenario IV: Floodable land use with heritage consideration

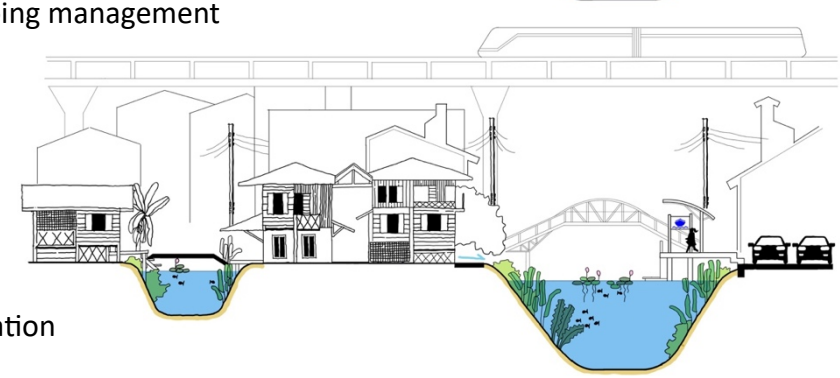


Scenario V: Highlight urban functionality

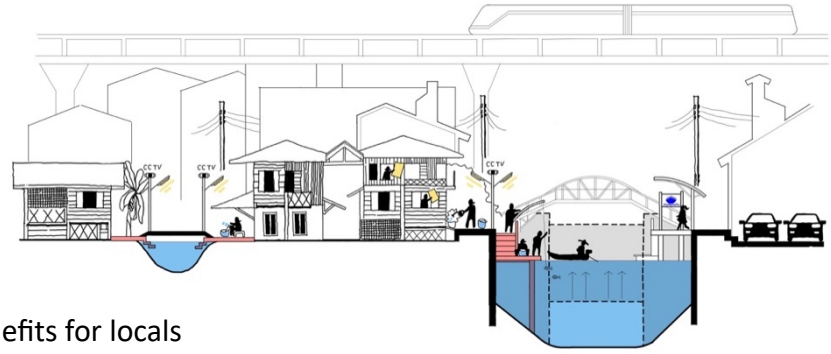
Five scenarios of future landscape change: Minburi Upatum CO-02



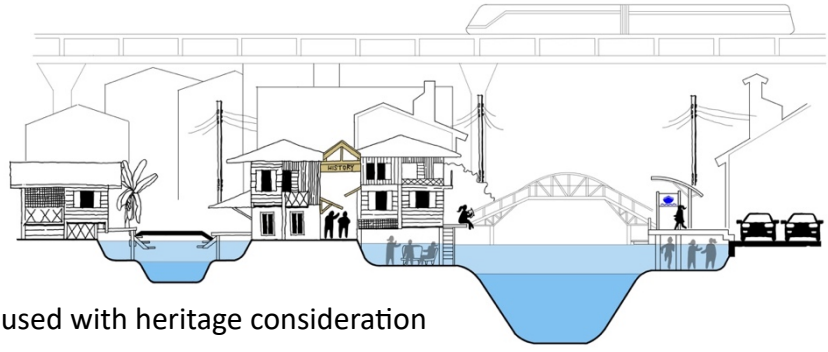
Scenario I: Enhanced ongoing management



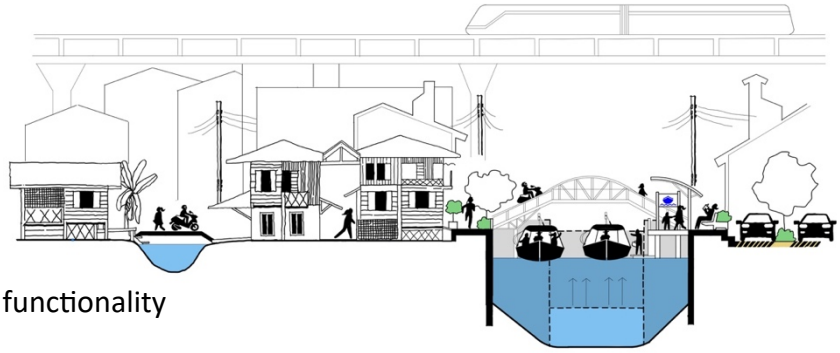
Scenario II: Natural restoration



Scenario III: Prioritising benefits for locals

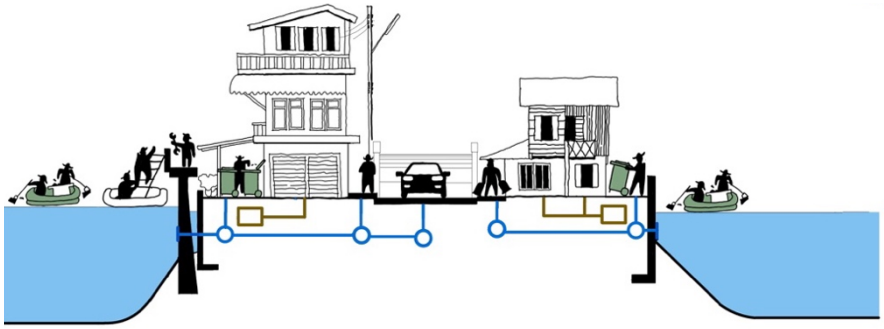


Scenario IV: Floodable land used with heritage consideration

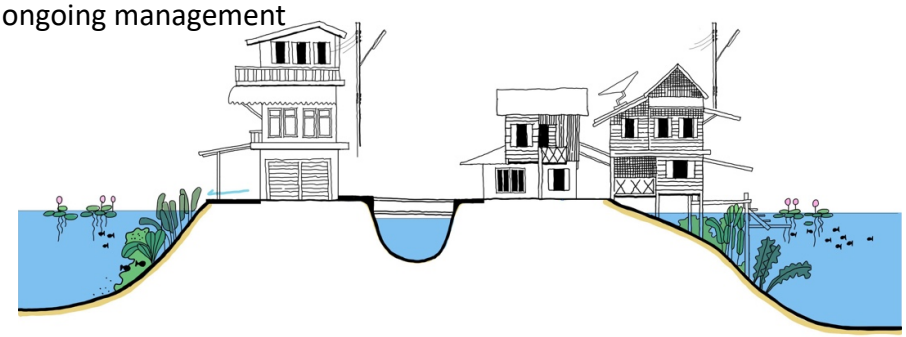


Scenario V: Highlight urban functionality

Five scenarios of future landscape change: Talad Nongchok CO-03



Scenario I: Enhanced ongoing management



Scenario II: Natural restoration



Scenario III: Prioritising benefits for locals



Scenario IV: Floodable land used with heritage consideration



Scenario V: Highlight urban functionality

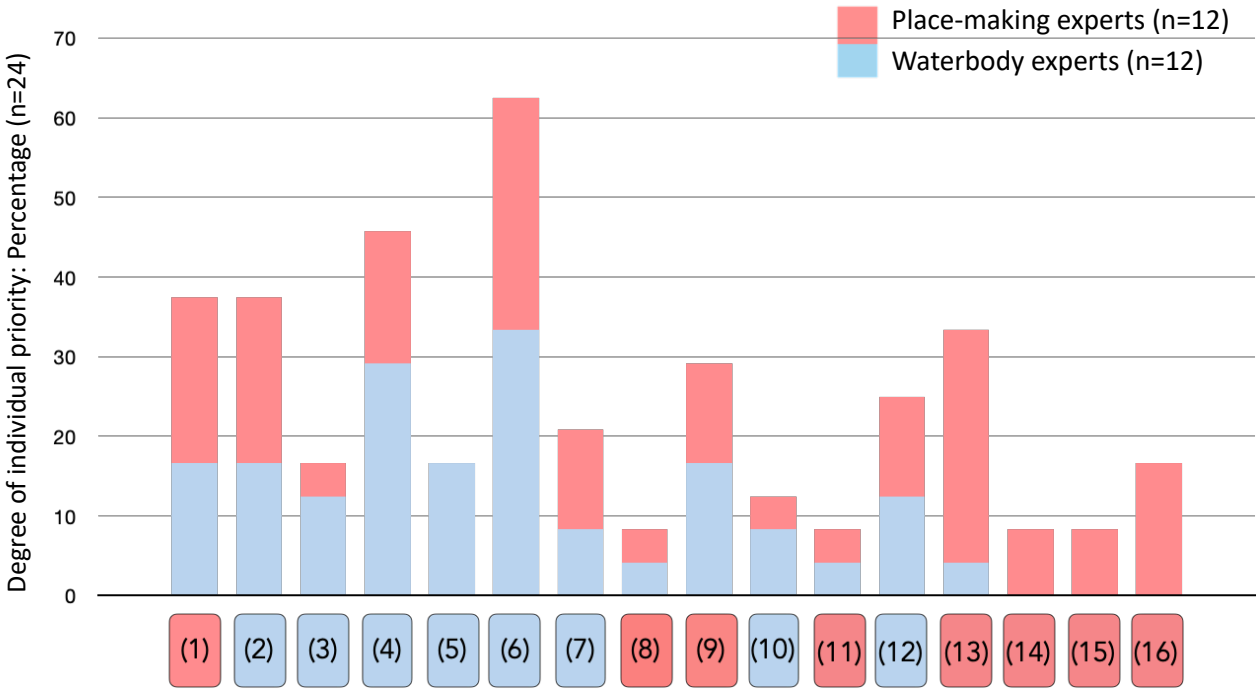
F. Additional examples/quotations in Landscape value with its change

(Section 5.5 Chapter 5)

5.5.1 Food production value
"…The small waterways had the water wheel or traditional impeller made from wood, then the water would be diverted from Sanseab Canal to the small waterways. We could stop the wheel in order to stop water to flow in the paddy field. The area here [Minburi Upatum] was all been paddy fields. […] The paddy field was benefit from the flood season. […] The type of rice proper to growth here can prevent floods because its height is more than 2 m." RE-05
"There used to have the lotus around here. We could use the trunk of lotus to be ingredient for cooking, including many edible pants here. There were also the fishes, crabs, shells." RE-08
"There are the farmer's houses settled adjacent to Sanseab Canal. Normally along this waterway edge, there are edible gardens (banana, zucchini, morning gory, etc.) […] This is the zucchini and eggplant and those are the mulberry, mango, and olive trees. Those are all planted in the soil directly not in the pots. […] Over there [in Sanseab Canal], he [the local fisherman] found the scallops. He may collect them [scallops] for more than a kilogram." RE-10
"The residents who did agricultural activities benefiting from the waterways settled there [Bangkok] before the town's establishment. […] The small waterways were excavated by residents with no record. […] The dug waterways brought not only waterbody to benefit gardens, but also brought fishes." EP-02
5.5.2 Daily consumption value
"We use water to do everything: the water work just came afterwards. We usually had to scoop the water during the nightime because the water level at night was higher than the daytime." RE-09
"That blue pipes are used for diverting the water from the Sanseab Canal through the residents' house. This means residents here both use the freshwater operation, waterwork, from the government (Phrapa) also the water from Sanseab Canal. […] After the flood dike construction which disconnect the water from Sanseab Canal to the farmlands, the farmers have to request the gap to connect the water from Sanseab Canal through the Lamrang [minor waterway]." RE-08
5.5.3 Transportation value
"There were the paddling boats selling mangos. There were also the gardeners paddling from Thonburi [western Bangkok] to here [Banglampoo Canal] at Wonchart market pier and exchanged their fruits to the merchants. There were the ships transporting the teaks to the sawmills. […] Some other boats travelled here and sold goods to us. […] The big ships leaded other ships to the market named Mahanak." RE-01
"We parked our boats [in a minor waterway] nearby our houses which had the small terraces in order to relocate our goods [from houses to boats]. We departed from here [Sanseab Canal] in early mornings before sunrise and paddled back here in the evenings. There was also the market [Minburi Upatum] which we sold goods from our houses… People paddled here to buy and exchange the goods. This Sanseab Canal connected to Praweat Canal and Suan Luang Canal. We were all using boats to transport everywhere because there wasn't the watergated operation." RE-06
"I think the waterways is the infrastructure of the transportation- but not that much. Sanseab canal has the water transportation and some canals in the conservation zone also have the boat transport..." GA-02
5.5.4 Ecological or biodiversity value
"There used to have a lot of lotus around here [Sanseab Canal]. We could use the trunk of lotus as an ingredient for cooking… many edible pants used to grow here [Sanseab Canal edge]. There were also the fishes, crabs, shells…" RE-08
"The riparian landscape in our city [Bangkok] was not that abundant because the waterways were manmade, but they did have plantations around the banks of waterways. […] The flow of water in this flat landscape as the natural cycle created natural habitation." EP-02

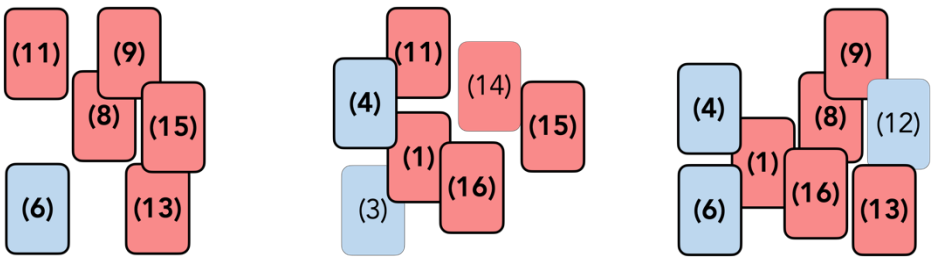
5.5.5 Livelihoods value
"There were the houses where sold the products such as fish-source, garlic, rice, chili, etc. to residents or someone who passed by. We sold the product at our houses. When there were some boats pass by or stopped here, they could buy the products from us. […] There was the wooden bridge where we used to get access to other side of canal. People from other sides could come here to buy any products. This location was very chaos and dense of products. People walked and paddled to buy goods from our houses… there were a lot of boats parking there [Minburi Upatum]. There were gold shops, sardine shop, Chinese drug shop, ice shop, etc. […] At time, there were no department stores or supermarkets, so our grocery stores were mandatory to everyone." RE-06
"…They transported coconut, rice, log etc. If some houses had the animal farm such as ducks or chickens, they would placed them in the big bamboo boxes (10 chickens could stay inside). Then they put the boxes in the boats. […] They had to manage the space to put more things inside because the transportation uses a very long time to reach the destination. They transported from here [Talad Nongchok] to Phratunam… around 12 hours to reach there. The boats were slow because the heavy weight." RE-08
5.5.7 Day-to-day cultural value
"We were born and grew up seeing and using the [Banglampoo] canal… Even though the city has changed, and we don't need the canal's water as much anymore, it still holds significance for us. […] living adjacent the canal is preferable compare to living nearby the street." RE-03
5.5.8 Preservation value
"They [GA] have normally picked the historical districts and made the redevelopment or preservation plans, which mainly for the tourist development and enhance economic value. This is no consideration to any contexts of the locals." EP-04
5.5.11 Natural inundation value
"Historically, when there were no watergated, the water level would up and down naturally, especially in rainy season. The water level would almost reach the land of community but not inundated to make any disaster. There was the small channels where connect to canals and flow inside the area. When the water level was rising, the small channels would be receiving the water." RE-06

G. Workshop findings of 16 schemes prioritisation



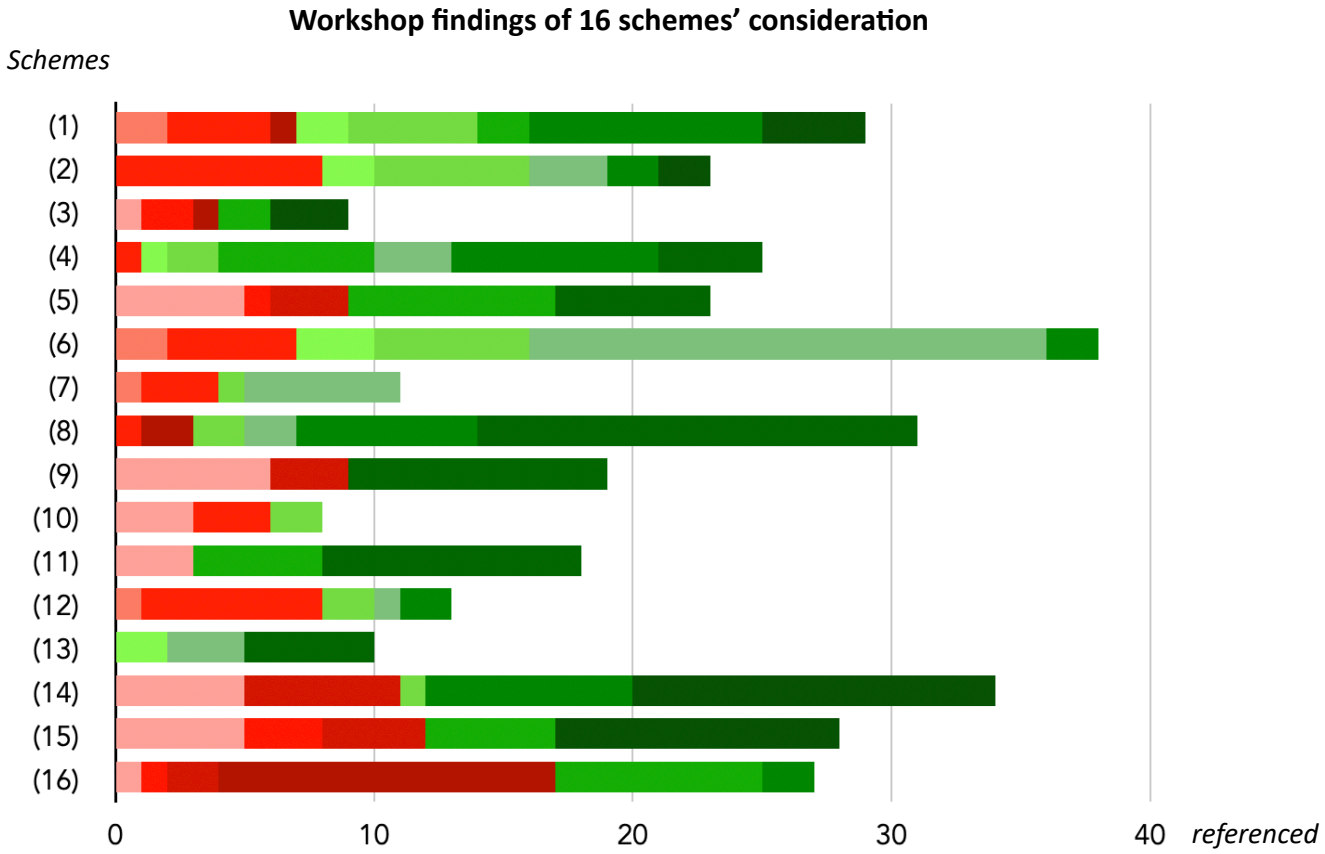
(1) Boundary control and relocation improvements
(2) Increasing detention areas
(3) Improving structure capacity
(4) Improving wastewater treatment
(5) Improving garbage collection
(6) Restoring waterflow and network
(7) Restoring waterway bank
(8) Granting permission to inhabit and earn a livelihood
(9) Enabling access for routine consumption
(10) Equilibrating the operation of watergates
(11) Providing safety and security
(12) Floodable land use at the waterway edge
(13) Considering heritage or areas identity
(14) Emphasis on public water transportation
(15) Providing recreational public access
(16) Involving investors and developers

Fig G-1: Participants' decision regarding priority on the sixteen schemes in BUW considering Bangkok as a whole



CO-01 Banpantom CO-02 Minburi Upatum CO-03 Talad Nongchok

Fig G-2: Participants' decision in BUW future change considering three-community's contexts through sixteen schemes



(1) Boundary control and relocation improvements
(2) Increasing detention areas
(3) Improving structure capacity
(4) Improving wastewater treatment
(5) Improving garbage collection
(6) Restoring waterflow and network
(7) Restoring waterway bank
(8) Granting permission to inhabit and earn a livelihood
(9) Enabling access for routine consumption
(10) Equilibrating the operation of watergates
(11) Providing safety and security
(12) Floodable land use at the waterway edge
(13) Considering heritage or areas identity
(14) Emphasis on public water transportation
(15) Providing recreational public access
(16) Involving investors and developers

Non-priority considering:

Minimal and irrelevant change [6.4.1-a]
Overwhelming change with resulting resistance [6.4.1-c]
Extremely challenging and unlikely [6.4.2-b]
Short-term and inconsequential [6.4.3-b]
Sequential outcome and of little significance [6.4.3-d]
Benefits favouring specific groups [6.4.4-a]

Priority considering:

Substantial change that is pertinent [6.4.1-b]
Challenging but of great significance [6.4.2-a]
Simplicity and more possibility [6.4.2-c]
Long-term outcome of considerable importance [6.4.3-a]
Significant knock-on effect [6.4.3-c]
Primarily profiting locals [6.4.4-b]
Benefits serving the public with great importance [6.4.4-c]

Note: [6.4.1-a] refers to Section 6.4.1 sub-section a. Chapter 6, and so on

Fig G-3 The consideration/reasons of the sixteen schemes prioritisation
(Section 6.4 Chapter 6)

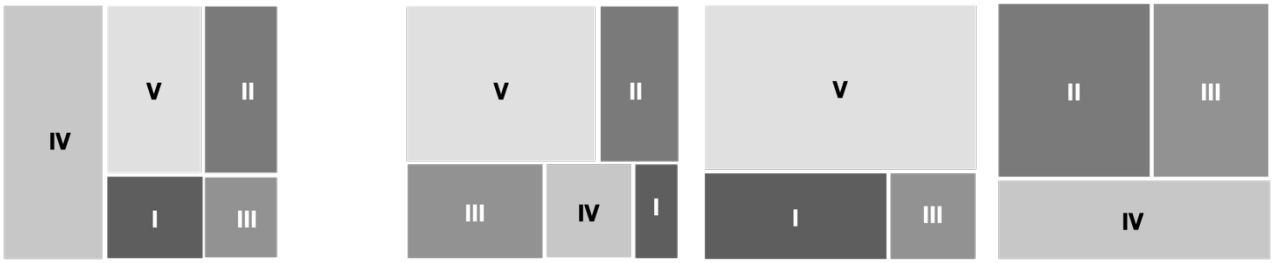
H. Summary in workshop findings of 16 schemes

Each schemes can be integrated through the workshop discussion
▪ From the perspective of WB experts, schemes (14), (15), and (16) were considered less important, whereas PM experts placed greater emphasis on them.
▪ The viewpoints of PM experts, scheme (13) was overwhelmingly chosen as a priority, with less emphasis from the WB experts.
▪ The shared priorities within the context of the CO, indicating that schemes made in later stages involved a more integrated blend of knowledge when determining shared priorities.
Schemes (4) and (6) consistently ranked highly in both the BUW scale and CO's contexts.
▪ Scheme (6) was prioritised due to its perceived significant impact, even though it presented challenges and was deemed important for the long term, evidently as a shared priority in CO-01 and CO-03.
▪ Scheme (4) was considered a priority because of its higher likelihood of success and its primary benefit to local communities, making it a crucial choice. This was reflected in the shared priority of CO-02 and CO-03.
▪ Scheme (6) remained somewhat less significant due to the substantial changes, potential resistance, and the extreme difficulty associated with it, similar to (4).
There were variations in priority decisions between the BUW scale and the CO's context.
▪ Scheme (8) was not highly favoured on the BUW scale but emerged as a shared priority in the CO contexts. The reason for its lower priority on the BUW scale was its narrow benefit focus on specific groups. However, in the shared priorities of CO-01 and CO-03, it gained in importance due to its potential long-term outcome and the significant benefits it could bring to the local community
▪ Scheme (11) in the BUW scale, it received lower priority because it entailed minimal modifications and had limited relevance. However, in the CO-02 and CO-03 contexts, Scheme (11) emerged as a priority due to its simplicity, higher likelihood of success, and the significant benefits it could bring to local communities.
▪ Scheme (14) and (15) were deemed less important on the BUW scale, especially from the perspective of the WB, as they involved minimal alterations and yielded minor, sequential outcomes of limited significance. In contrast, the shared priority of Scheme (15) became apparent in the CO-01 and CO-02 contexts, while Scheme (14) gained significance in CO-02. This shared priority primarily stemmed from the substantial benefits these Schemes could offer to the public, underscoring their importance

Note: WB = Waterbody experts, PM = Place-making experts
CO-01 = Banpantom, CO-02 = Minburi Upatum, CO-03 = Talad Nongchok

(1) Boundary control and relocation improvements
(2) Increasing detention areas
(3) Improving structure capacity
(4) Improving wastewater treatment
(5) Improving garbage collection
(6) Restoring waterflow and network
(7) Restoring waterway bank
(8) Granting permission to inhabit and earn a livelihood
(9) Enabling access for routine consumption
(10) Equilibrating the operation of watergates
(11) Providing safety and security
(12) Floodable land use at the waterway edge
(13) Considering heritage or areas identity
(14) Emphasis on public water transportation
(15) Providing recreational public access
(16) Involving investors and developers

I. Workshop findings of five scenarios' prioritisation



BUW overall scale *CO-01* *CO-02* *CO-03*

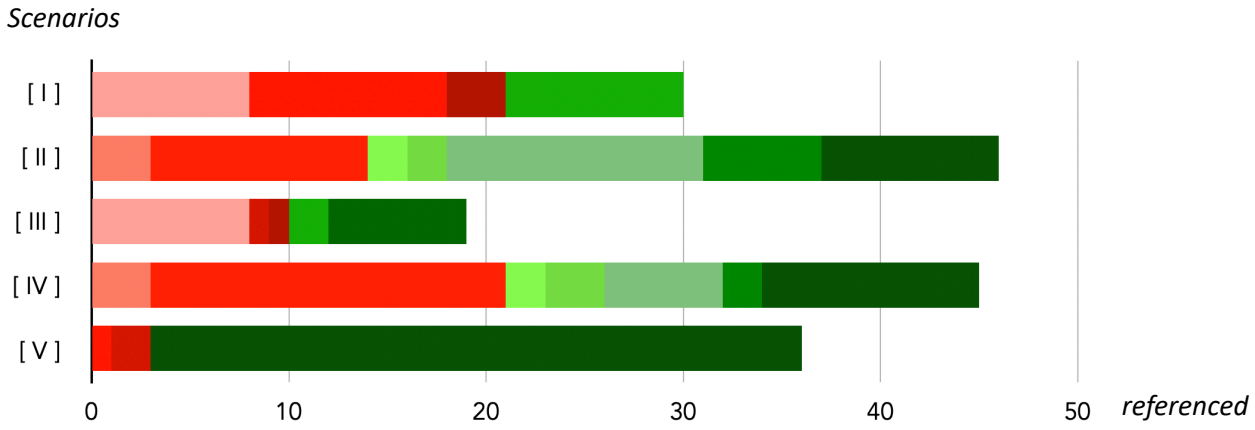
Five scenarios of desirable landscape change of BUW

I Enhanced ongoing management
II Natural restoration
III Prioritising benefits for the locals
IV Floodable land use with heritage consideration
V Highlight urban functionality

Note: CO-01 = Banpantom, CO-02 = Minburi Upatum, CO-03 = Talad Nongchok

Fig I-1: The hierarchy charts regarding the priority of five scenarios considering Bangkok's overall scale (Left) and three-community's context (The other three Right)

Workshop findings of five scenarios consideration



Non-priority considering:

Minimal and irrelevant change [6.4.1-a]
Overwhelming change with resulting resistance [6.4.1-c]
Extremely challenging and unlikely [6.4.2-b]
Short-term and inconsequential [6.4.3-b]
Sequential outcome and of little significance [6.4.3-d]
Benefits favouring specific groups [6.4.4-a]

Priority considering:

Substantial change that is pertinent [6.4.1-b]
Challenging but of great significance [6.4.2-a]
Simplicity and more possibility [6.4.2-c]
Long-term outcome of considerable importance [6.4.3-a]
Significant knock-on effect [6.4.3-c]
Primarily profiting locals [6.4.4-b]
Benefits serving the public with great importance [6.4.4-c]

Note: [6.4.1-a] refers to Section 6.4.1 sub-section a. Chapter 6, and so on

Fig I-2: The consideration of each scenario regarding priority and non-priority (Section 6.4 Chapter 6)

J. Summary in workshop findings of five scenarios

Scenario I	received the least attention, especially when considering the overall scale of the BUW. This is because Scheme I involves minimal alterations and is generally considered irrelevant. It also has short-term and inconsequential effects, particularly being deemed unimportant in the CO-03 context. Nevertheless, there is still some priority given to Scheme I due to its simplicity and higher likelihood of implementation.
Scenario II	was prioritised for the overall BUW and CO-01 and CO-03 contexts because, for example, it represents substantial changes that are highly relevant. It is also noted for its significant knock-on effects and its benefits being particularly important to the public. However, it is considered insignificant, particularly in the CO-02 context, because it entails overwhelming changes that could result in resistance and is extremely challenging and unlikely.
Scenario III	received lower priority in the BUW scale because it leads to sequential outcomes of little significance and benefits that cater to highly specific groups of locals. However, it gained priority in the CO's contexts, especially CO-03, due to its focus on benefiting local communities and its perceived simplicity and higher likelihood of success compared to other scenarios.
Scenario IV	was the most frequently selected option in the overall BUW context. This is because, for example, it can bring about substantial and pertinent changes. It also has significant knock-on effects and provides benefits that serve the public with great importance. However, it was not prioritised in CO-01 and CO-02 because it involves overwhelming changes that could encounter resistance and is considered extremely challenging and unlikely to be called on.
Scenario V	was considered highly significant, receiving priority in both the overall BUW scale and the CO-01 and CO-02 contexts. This is because Scenario V serves the urban functions. However, there were instances where it was deemed insignificant due to its short-term and inconsequential nature.

Note: CO-01 = Banpantom, CO-02 = Minburi Upatum, CO-03 = Talad Nongchok

Five scenarios of desirable landscape change of BUW

I Enhanced ongoing management
II Natural restoration
III Prioritising benefits for the locals
IV Floodable land use with heritage consideration
V Highlight urban functionality

K. Additional examples of discussion in workshops refers to three-community's context

(Section 6.3 Chapter 6)

Banpantom
"We still insist to understand or study the network of the waterways as a whole first, although this will become the site base solution. This should be done in a bigger scale before designing or renovating the area along the waterways including this conservation area. […] We need more spaces in order to receive the water, but we will never know how much we will need until we fully understand the system. […] The data will show whether CO-01 could be the spaces to let the water flow naturally, or how the position of CO-01 will facilitate the hydrological system of Bangkok." G-1
"I still endorse the notion of flexible land use for conservation area, but I'm uncertain about employing it for full-fledged residential living. It might be more suitable to apply for the green space, a park, or shared spaces where the impact of floods is minimal. […] Scheme IV, floodable land use, can be adapted if it is for temporary functions…no permanent residential use. " G-6
Minburi Upatum
"We concern the way of life and the relationship that locals (will) have with the waterways, both before and after any project will be executed. In CO-02, residents previously used local boats for transportation and engaged in traditional fishing. Our goal proposes to ensure the 'public' accessibility to the waterway, while still respect the local cultural identity. This considers both the historical dimension of the neighborhood and benefits for publicity." G-2
"This urban context of community has an opportunity for adaptive land use implication, particularly concerning the investment properties. The existing parking lot nearby the Sanseab Canal, for instance, could be renovated to incorporate permeable pavement. If this similar approach in public spaces were applied along the Sanseab Canal, this will contribute to the effective mitigation of water levels. This could have long-term benefits for landscape changes in the future." G-5
Talad Nongchok
"Despite their dilapidated condition [of houses along the Sanseab Canal-side], these houses [in Talad Nongchok] showcase a profound connection to the waterways as a part of the natural landscape. […] How high the water level rises, these houses remain unaffected. This highlights an innovative approach to heritage preservation, which proposes that similar areas settled along waterways could also adopt this architectural concept, with a focus on incorporating innovative techniques and strategies." G-3