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SINKING BANGKOK:

THE INTERPLAY OF POLICY COALITIONS, DISCOURSES AND UNCERTAINTIES

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Observing subsidence damage on the field in 2004. Source: Buapeng, 2005.

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PRESENTATION OVERVIEW

Introduction

I. 5 Decades of problem framing and policy making

II. Policy advocacy arena: formation of a compromise coalition

III. Interpreting subsidence: controversies, data production and narratives

Conclusion: two-speed subsidence phenomenon



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INTRODUCTION: HYDROGEOLOGY OF THE BANGKOK DELTA

- Deltas are both auspicious and challenging environments for city development.
- Young delta soil = unconsolidated/semi-consolidated sediments
- Prone to land subsidence



"Location and general features of the Bangkok Basin, Thailand". Figure by Sanford and Buapeng (1996). Modified from Kokusai Kogyo Co., Ltd. (1995).





INTRODUCTION: GROUNDWATER-INDUCED LAND SUBSIDENCE

Recoverable land subsidence caused by

When long-term pumping lowers ground-water levels and raises stresses on the aquitards beyond the preconsolidation-stress thresholds, the aquitards compact and the land surface subsides permanently.



Source: USGS, 1999. https://www.usgs.gov/media/images/aquifer-compaction



Well Interference Caused by Overlapping Cones of Depression Resulting from Insufficient Well Spacing



Source: <u>http://jacobswellspringnews.blogspot.com/2012/02/wvwa-urges-public-</u> comment-to-twdb-to.html

INTRODUCTION: RESEARCH FOCUS

Adressing a gap in the current literature

 Current literature on land subsidence in Bangkok is dominated by technical reports from soil and groundwater engineers' perspective

Research question

• How did the interplay between knowledge production and policy advocacy lead to current narratives of stabilized land subsidence when the submergence of Bangkok is still a matter of controversy?

Theoretical framework

- Political Ecology
- Advocay Coalition Framework
- Multiple Streams Framework
- Epistemic Communities



••••• I. 5 DECADES OF PROBLEM FRAMING AND POLICY MAKING 1968 – 1982: EMERGENCE OF THE PROBLEM

Growing water usage as the city grows

- Public pumpage starts in **1954**
- Private pumpage starts around the early **1960s** and outgrows public pumpage by **1974-1975** (Babel et al., 2006)

Year	Public pumpage (m ³ /d)	Private pumpage (m ³ /d)
1954	8 360	Unavailable
1974	360 000	360 000
1982	446 000	944 000

Table by author, numbers adapted from Ramnarong and Buapeng (1993).



•••• I. 5 DECADES OF PROBLEM FRAMING AND POLICY MAKING 1968 – 1982: EMERGENCE OF THE PROBLEM

When land subsidence in Bangkok enters the problems stream

- First research report by Cox (1968)
- Issue raised during the drafting of a master plan for Bangkok water supply (Haley and Aldrich, 1970)
- Groundwater Act in 1977
 - → Setting up of a Groundwater Committee which provides counsel to the Cabinet
- First comprehensive investigation between 1978-1981
 - → Boundaries of knowledge begin to be drawn within this nascent epistemic community





OBSERVABLE DAMAGE ON BUILDINGS







I. 5 DECADES OF PROBLEM FRAMING AND POLICY MAKING



1983 – 2003: CONCENTRATED POLICY EFFORTS

- 1983: First amendment of Groundwater Act + defining groundwater critical zones
- Phasing out of groundwater usage for public waterworks, planned for 1987, happened in the late 1990s.
- 1985: pricing of Groundwater Thbt 1/m³ (vs. Thbt 4.926/m³ for surface tapwater)
- 1994: tariff increased from Thbt 3.5/m³ to Thbt 8.5/m³ by 2003



•••• I. 5 DECADES OF PROBLEM FRAMING AND POLICY MAKING 2003 – PRESENT: SUBSIDENCE CONCERNS SUBSIDES

- Reunion of circumstances lead to the recovery of groundwater levels within the principal critical zones:
 - 1997 economic crisis
 - Gradual pricing of groundwater (A conservation fee was implemented in addition to the usage fee in 2003 and reached the same price as the usage fee in 2006)
 - Better supply and coverage of public waterworks
 - More strict enforcement of groundwater ban by revoking pumping license
- Subsidence nowadays contained to an average rate < or = to 1cm/yr within Bangkok city
- Cones of depression started growing in the neighboring provinces of Bangkok (Samut Prakan and Samut Sakhon)
- Growing narrative of a success story: World Bank (Foster and Buapeng, 2008) and Department of Groundwater Resources (Office of Groundwater Resources Conservation and Rehabilitation – DGR, 2018).
- Yet, in 2015 National Reform Council created a committee to handle the Sinking Bangkok crisis.





WATER LEVEL RECOVERY AND LAND SUBSIDENCE STABILISATION IN EASTERN PART OF BANGKOK

15

Graph showing the relationship between water level in three aquifers (in meters below surface), land subsidence rate (in centimeters of accumulated subsidence on the right and in centimeters per year on the graph) and policy measures (the creation and revision of critical zones in 1983, 1995 and 2000 as well as the pricing of groundwater).

Source: Lorphensri et al. (2011: 139)

estion de l'Equ. Acteurs, Usages



Water level, total subsidence, and subsidence rate of eastern Bangkok (at Ramkhamhaeng University)

10

12

II. POLICY ADVOCACY ARENA:

Urgent limitation of subsidence coalition

- Promoting switch to surface tap water
- Less costly regulation by pricing

 Groundwater pumping should stop within critical zones

Economic profitability coalition

- Arguing for groundwater quality and reliability
- More costly project of artificial aquifer recharge or financial support in relocating industries

 Groundwater pumping can be reduced to handle subsidence, but without hurting the economy



II. POLICY ADVOCACY ARENA:

- Reasonable groundwater usage: a policy middle ground
 - Groundwater is a valuable resource
 - It would be a waste not to use it
 - Absurd to completely ban its usage because some types of industries rely on its quality and general reliability
 - Should always be an option in case of extreme drought events
- Policy advocacy against future threat of submergence
 - Raising coastal roads to act as dykes
 - Increasing shoreline through sediment filling to act as giant sand/earth dyke
 - Builing a 88 km Sea wall



Structural measures 3: สร้างประดูกั้นน้ำยาว 88 กม. ในอดีดเดยมีการเสนอให้ถมดินทำ เขื่อนแต่อาจจะมีผลกระทบมากเกินไป การสร้างประดูระบายน้ำเช่นนี้จึงอาจจะเป็นทางเลือกที่ดีกว่า

Source: (Soralump, 2019: 14)



III. INTERPRETING SUBSIDENCE:

- Limits of monitoring and modeling
- Safe yield = « amount of groundwater which can be withdrawn from [a groundwater basin] without producing undesired results » (Todd, 1959 in Kokusai Kyogo Co., Ltd., 1995)
- Stable situation narrative: « prepare, but don't panic » -Suttisak Soralump



Graphic by Rafa Estrada. Circulated by Channel News Asia. Modified by Dr. Suttisak Soralump.



CONCLUSION: TWO-SPEED SUBSIDENCE

- Subsidence interpreted differently for the various narratives
 - Research funding
 - Capital city relocation
 - Increase clients for surface tap water
 - Recovery allows for pumping
 - Too much rebound has negative impacts on underground infrastructures
 - Future risk of submergence can be handled through hard infrastructures
 - Blame game around the flood causes: Drainage Department VS Groundwater Departement

• Spatial externalities still pose a problem and are sometimes downplayed for discursive coherence







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THANK YOU

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PhD in progress

