EFFECTIVE NUCLEAR SAFETY GOVERNANCE FOR HONG KONG AND GUANGDONG CHINA: A STAKEHOLDER TRUST-BASED MODEL

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Outline

1. Introduction
   - Background information of nuclear power plants in Guangdong China
   - Attitudes towards nuclear energy in Hong Kong and China
2. Nuclear Safety Governance in Hong Kong
3. Methodology for Stakeholder Trust-based Model

1. Introduction


Hunan
湖南省
Jiangxi
江西省
福建省
Fujian
Guilin
桂林
Yangshuo
阳朔
Shaoguan
韶关
Yuebei
粤北
广东省
Guangdong
广西壮族自治区
Guangxi Zhuang Autonomous Region
Meizhou
梅州
Xiamen
厦门
Beijiang
北江
Conghua 从化
Xinfengjiang Reservoir
新丰江水库
Dongjiang
东江
Chaoshan
潮汕
Chaozhou
Shantou
汕头
Wuzhou
梧州
Qingyuan
清远
Heyuan
河源
Guangzhou
广州
Yujiang
郁江
Xijiang
西江
Zhaoqing
肇庆
Foshan
佛山
Dongguan
东莞
Huizhou
惠州
Shanwei
汕尾
Shenzhen
深圳
Pearl Delta
珠江三角洲
Huidong
惠东
Zhongshan
中山
Zhuhai
珠海
Hong Kong 香港
Hong Kong
香港
Macau
澳门
Enping
恩平
Yangjiang
阳江
Maoming
茂名
Hainan
Qiongzhou Strait
Wuchuan
Zhanjiang
湛江
Leizhou Bay
雷州湾
Leizhou
雷州
Leizhou Peninsula 雷州半岛
Xuwen
Haikou 海口
海南省
Hainan
South China Sea
南中国海
Daya Bay Nuclear Power Station 2*1000MW
Yangjiang Nuclear Power Station 6*1000MW
Ling Ao Nuclear Power Station 4*1000MW

Background

Daya Bay Nuclear Power Station

- Joint venture between Hong Kong Nuclear Investment Co. Ltd (HKNIC) & Guangdong Nuclear Investment Co. Ltd (GNIC)
- 1987-Construction started
- 1994-Operation started
- 70% power output supplying Hong Kong
- Meeting 23% of local electricity demand
- 50 km from HK’s city centre

Background

Daya Bay Nuclear Power Station
Distance from HK: ~50 km

Operator(s) Guangdong Nuclear Power Joint Venture Co.

Commission date	**Unit 1: August 31, 1993** **Unit 2: February 2, 1994**
Operator(s)	**Guangdong Nuclear Power Joint Venture Company**

Reactor information

Reactors operational	**2 x 984 MWe**
Reactor type(s)	**PWR - CPR-1000**

Data from Wikipedia:
CPR-1000 (improved Chinese **PWR**) is a Generation II+ pressurized water reactor, based on the French 900 MWe three cooling loop design imported in the 1990s, improved to have a net power output of **1,000** MWe (1080 MWe gross) and a 60 year design life.

Background

Yangjiang Nuclear Power Station
Distance from HK: ~200 km

Unit	Type	Construction start	Operation start
		Phase I	
Yangjiang 1	**CPR-1000**	**16 December 2008**	***August 2013***
Yangjiang 2	**CPR-1000**	**4 June 2009**	***2014***
Yangjiang 3	**CPR-1000**	**15 November 2010**	***2015***
Yangjiang 4	**CPR-1000**	***15 March 2011***	***2016***
		Phase II	
Yangjiang 5	**CPR-1000**		
Yangjiang 6	**CPR-1000**		***2017***

Background

Ling Ao Nuclear Power Station
Distance from HK: ~450 km

Commission date	**28 May 2002**
Operator(s)	**Lingao Nuclear Power Company Ltd.**

Reactor information	
Reactors operational	**2 x 990 MWe, 1 x 1080 MWe**
Reactors under construction	**1 x 1080 MW**
Reactors planned	**4 x 1080 MW**
Reactor type(s)	**PWR, CPR-1000**


大亞灣核電廠與香港距離
大亞灣核電廠
50公里
30公里
20公里
惠陽
深圳
南澳
新界
大鵬灣
吐露港
屯門
西貢
九龍
赤鱲角
香港

Background

1. Daya Bay Power Plant is just 54 km away from Central, Hong Kong (HK)

2. 14 generation units has been approved or under construction in the Guangdong Province

3. Nuclear Safety (NS) Governance is critical to ensure HK people's safety

- Recent Fukushima crisis has shown that even sophisticated power plants are subject to human errors and unforeseeable events

Public Attitudes towards Nuclear Safety BEFORE & AFTER Fukushima in Hong Kong and China

Analysis of Attitudes Based on Newspapers

- Newspaper database: 20 HK- and China-based English language newspapers on Wisenews
- Period: 2010/5/1 – 2011/4/30
- Total no. of articles with key phrase “nuclear power” = 950
- No. of sampled articles used = 100 (out of 950)
  - No. of sampled articles before tsunami (2011/3/11) = 48
  - No. of sampled articles after tsunami (2011/3/11) = 52

Words Associated with "Nuclear Energy" (Pre-Fukushima)

WORD	COEFF	C.E.(A)	C.E.(AB)	CHI2
replace	0.239	5	2	38.301
vehicle	0.222	13	3	31.059
coal	0.206	27	4	24.413
gas	0.178	9	2	19.687
plan	0.171	39	4	14.97
Guangdong	0.171	22	3	16.3
efficiency	0.154	3	1	15.591
fuel	0.154	27	3	12.386
generate	0.154	12	2	13.896
natural	0.154	12	2	13.896
electricity	0.149	29	3	11.205
industry	0.138	34	3	8.875
ambitious	0.134	4	1	11.232
carbon	0.134	16	2	9.58
citizen	0.134	4	1	11.232
common	0.134	4	1	11.232

Words associated with "Nuclear Energy" (Post-Fukushima)

WORD	COEFF	C.E.(A)	C.E.(AB)	CHI2
lawmaker	0.229	4	2	46.535
reduce	0.191	13	3	29.401
comment	0.187	6	2	29.79
key	0.187	6	2	29.79
plan	0.187	74	7	22.337
solar	0.173	7	2	25.013
crisis	0.168	30	4	19.94
call	0.158	19	3	18.488
decade	0.145	10	2	16.434
fossil_fuels	0.132	3	1	14.847
view	0.132	12	2	13.112
China	0.129	113	6	6.967
country	0.127	13	2	11.839
mainland	0.125	54	4	8.348
nuclear_power_plant	0.12	33	3	8.59

Words associated with "Nuclear Safety" (Post-Fukushima, HK & CHINA)

WORD	COEFF	C.E.(A)	C.E.(AB)	CHI2
statement	0.298	12	4	77.704
Premier_Wen_Jiabao	0.258	4	2	59.738
decision	0.234	11	3	46.569
construction	0.22	22	4	39.32
approval	0.2	15	3	32.761
Comprehensive	0.195	7	2	32.568
monitor	0.183	18	3	26.445
plan	0.18	74	6	21.598
review	0.169	21	3	21.943
nuclear_reactors	0.163	10	2	21.723
suspend	0.149	12	2	17.515
announce	0.143	13	2	15.9
nuclear_power_plant	0.141	30	3	13.88

Words associated with "Nuclear Crisis" (Post-Fukushima, HK & CHINA)

WORD	COEFF	C.E.(A)	C.E.(AB)	CHI2
Japan	0.232	29	6	41.559
expansion	0.231	13	4	44.14
review	0.228	21	5	40.913
Chinese_Academy	0.209	4	2	37.926
worry	0.198	10	3	32.03
HK	0.174	23	4	21.97
false	0.17	6	2	24.047
strategy	0.167	14	3	21.369
Nuclear	0.165	102	8	13.88
lesson	0.158	7	2	20.091
National_Developmen	0.158	7	2	20.091
sector	0.158	7	2	20.091
trigger	0.158	7	2	20.091
impact	0.156	16	3	18.052
commission	0.147	8	2	17.129
company	0.147	8	2	17.129

Analysis of Attitudes Based on Chinese Newspapers

- T-Lab operated with text corpora, i.e. samples of text to serve as raw data for input.
- “Nuclear power”, “nuclear energy” and “China” were set as search criteria to filter ALL China-based English languages newspaper articles, in the period of January 2006 to December 2011.
- A sample of 1107 articles in total was obtained.
- A line was drawn on March 11, 2011 to divide the articles into two subsets, the pre-fukushima and post-fukushima.

Analysis of Attitudes Based on Chinese Newspapers

- “Word mapping” was used to generate tables that listed words most closely related to nuclear power. These tables facilitated understanding of the conceptual meaning of nuclear power with reference to other words that frequently co-occurred.

- “Thematic cluster analysis” identified and divided the media discourse into a number of themes (Sengers et al., 2010).

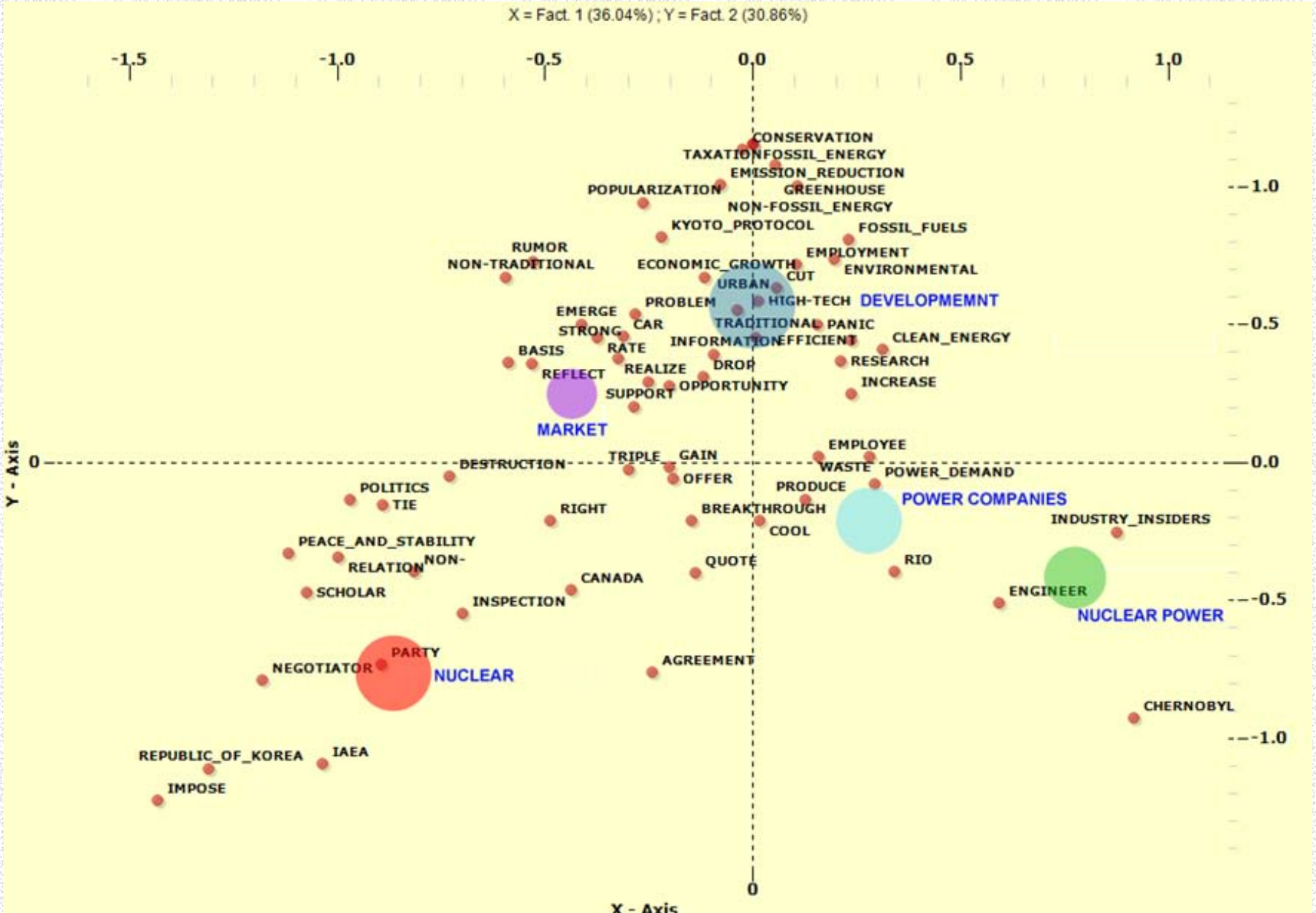
Words Associated with "Nuclear Power" (Pre-Fukushima, China Only)

Word	Cosine Coefficient	Occurrence
plant	0.426	1105
China	0.323	4547
capacity	0.237	713
energy	0.219	2022
reactor	0.205	409
construction	0.204	575
development	0.2	1651
build	0.192	640
nuclear	0.19	1157
project	0.19	961
technology	0.188	887
plan	0.177	756

Words Associated with "Nuclear Power" (Post-Fukushima, China Only)

Word	Cosine Coefficient	Occurrence
plant	0.554	506
Fukushima	0.306	245
Japan	0.258	1093
safety	0.257	223
China	0.252	1742
Daiichi	0.251	84
nuclear	0.239	540
crisis	0.201	200
development	0.183	582
energy	0.175	529
approval	0.17	94
tsunami	0.169	186

Pre-Fukushima Thematic Cluster



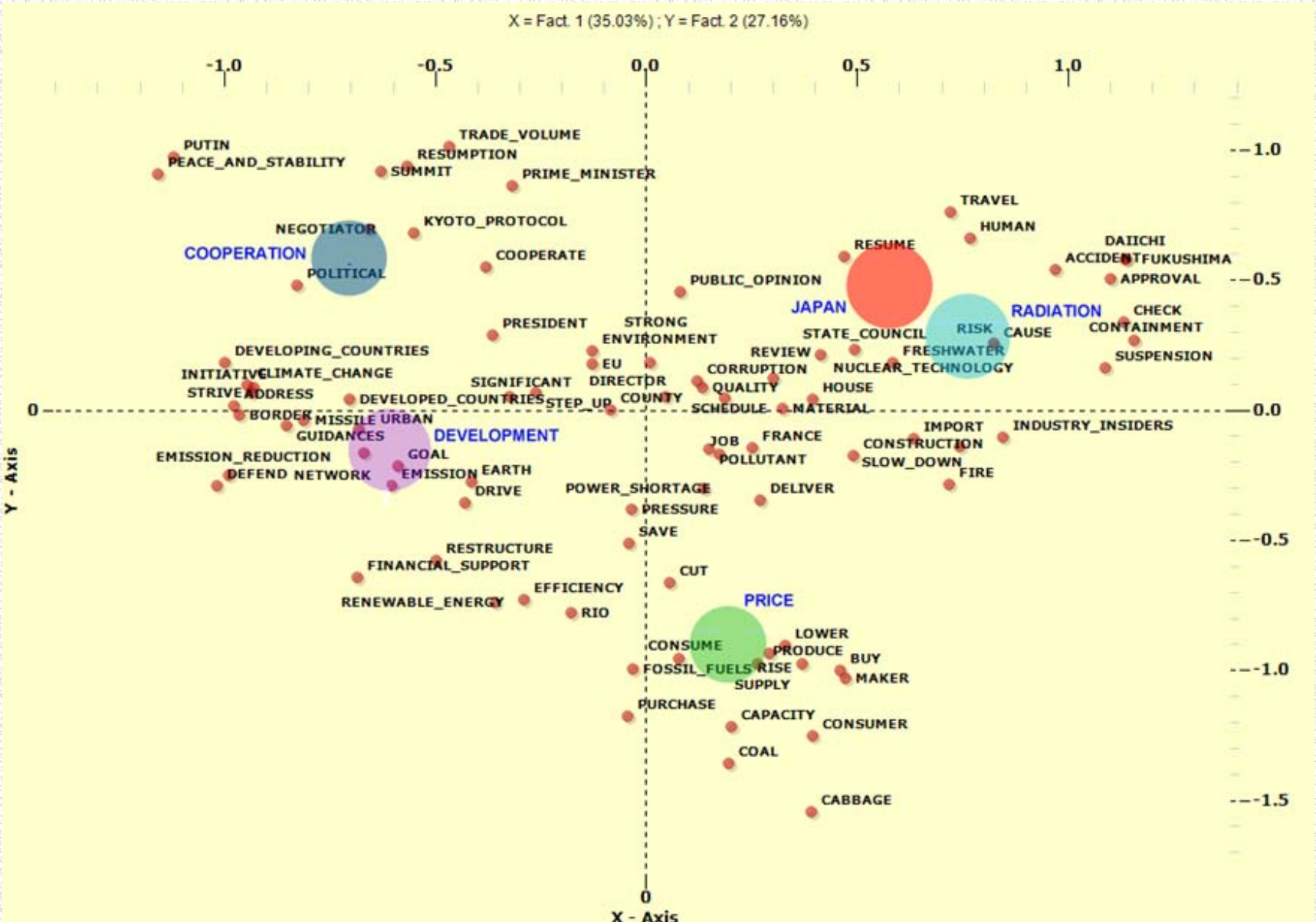
Pre-Fukushima

- One of the discursive strategies identified was “naturalization”. Nuclear power was widely acknowledged as a self-evidently clean, efficient, safe and reliable energy source in media coverage. Descriptions about nuclear power pre-Fukushima were overwhelmingly positive. However, claims about the advantages of nuclear power were rarely supported with scientific evidence.

- *“China, realizing the huge potential of nuclear power as a clean energy, has already strengthened nuclear science education in recent years.”* -Shanghai Daily, 2009-03-04

- *“Nuclear power was a clean, high-efficient, safe and reliable energy. He emphasized that the acceleration of nuclear plant construction was an important measure to speed the change of economic growth patterns.”* - Shanghai Daily, 2008-02-19

Post-Fukushima Thematic Cluster



Post-Fukushima

- Nuclear power was rebranded as a low carbon energy source.
- Another discursive strategy – "necessitization" – was identified in the post-Fukushima discourse. This strategy described nuclear power as indispensible and irreplaceable:

❖ *"China needs nuclear energy to realize its two objectives: making non-fossil derived energy 15 percent of all primary energy sources, and cutting carbon emissions per unit GDP by 40 to 45 percent. Studies suggest that 10 to 15 percent of all the country's carbon-cutting objectives would depend on nuclear energy by 2020."* -China Daily, 2011-04-13

❖ *"With energy consumption increasing in China, the country cannot stop the development of nuclear power"* –China Daily, 2011-12-07

❖ *"Nuclear power is the most promising source of clean energy, considering the limitations and unresolved problems surrounding hydro, wind and solar energy."* –China, 2011-03-15

Post-Fukushima

- This strategy on one hand implicitly recognized the risks of nuclear power, on the other constructed a picture of no other viable or practical options were available so as to cultivate "reluctant acceptance" (Bickerstaff et al., 2008) among the audience.
- Since stronger reasons and justifications were needed to legitimize the development of nuclear power after the Fukushima disaster, the degree of importance of nuclear power was substantially elevated in the post-Fukushima discourse. While nuclear power was constructed as "one among many options" in pre-Fukushima discourse, it was reconstructed as "indispensible" in the post-Fukushima discourse.

Fears & Distrusts During Fukushima Crisis

- Low public trust in the HK Government
  - Low level of stakeholder trust in environmental and sustainability governance in HK (Hills, 2005)
  - Fears over Japan's nuclear radiation to spread to HK created a salt-buying craze across the territory.
  - Officials in Hong Kong and cities issued public statements trying to refute concerns about radiation poisoning and the need to stockpile salt. But the official reassurances appeared to do little to put shoppers' minds at ease.
- Low public trust in the Chinese Government
  - Public opinion polls conducted by the HKU Public Opinion Programme showed that the Hong Kong people have a very low level of trust towards the Chinese government in general
  - After the nuclear incident in Fukushima, HK public increasingly demanded the HK government to liaise with the Chinese government in cross-border on nuclear safety governance

Summary

- The above shows that
  - There is a growing stakeholder concern (worry) about nuclear risk and safety in the wake of Fukushima crisis.
  - There is a low level of public trust towards the HK and Chinese government before and after the Fukushima crisis.

- There is an urgent need to address the issue of nuclear safety and build stakeholder trust in nuclear safety decision-making, including contingency planning.

2. Nuclear Safety Contingency Governance in Hong Kong

Daya Bay Contingency Plan (DBCP) by HKSARG

- OLD Daya Bay Contingency Plan (DBCP) first developed in 1994
- 1987 Consultancy Study by the UK Atomic Energy Authority
- Windscale (1957), Three Mile Island (1979) & Chernobyl (1986) experience
- Risk assessment for HK
- Following international standards
- Development of monitoring, assessment & response capabilities by departments

Daya Bay Contingency Plan (DBCP) by HKSARG

- **DBCP reviewed, revised and issued in March 2011**
- **Enhancements introduced with reference to key learning from Fukushima incidents, international standards and overseas practices**
  - Government structure
  - Radiation monitoring
  - Notification arrangements
  - Accident consequence assessments
  - Public information and communication
  - Monitoring of persons within HK
  - Boundary control measures on inbound travelers and goods
  - Cross Boundary & External liaison, etc.

- **DBCP Website launched for public communication**
  http://www.dbcp.gov.hk/eng/dbcp/download.htm

Daya Bay Contingency Plan (DBCP) by HKSARG

Challenge 1: Emergency Response Structure – Interdepartmental Coordination

- Steered by senior officials
- Advised by professional departments
- Central coordination
- Operational departments

Challenge 2: Public Information – One Way Communication, Not Easily Understood by Layman

- Media strategy
- Information Policy Committee (convened by DIS)
- Combined Information Centre (ISD plus Police Public Relations Bureau)
- Press Briefing Centre
- Overseas information

Daya Bay Contingency Plan (DBCP) by HKSARG

Challenge 3: Radiation Monitoring Limited to Local Only

- Environmental Radiation Monitoring
  - Testing of local environmental samples
- Online Water Contamination Monitoring
  - Monitoring of water from Guangdong

Challenge 4: Lack of Transparency, Slow Information Disclosure

- Notification to HKSAR Government of Nuclear Incidents
  - By Guangdong Authorities
  - By International Atomic Energy Agency
  - By CLP Power (Daya Bay Nuclear Plants)

Gaps

- Planning and emergency response for nuclear safety governance in HK:

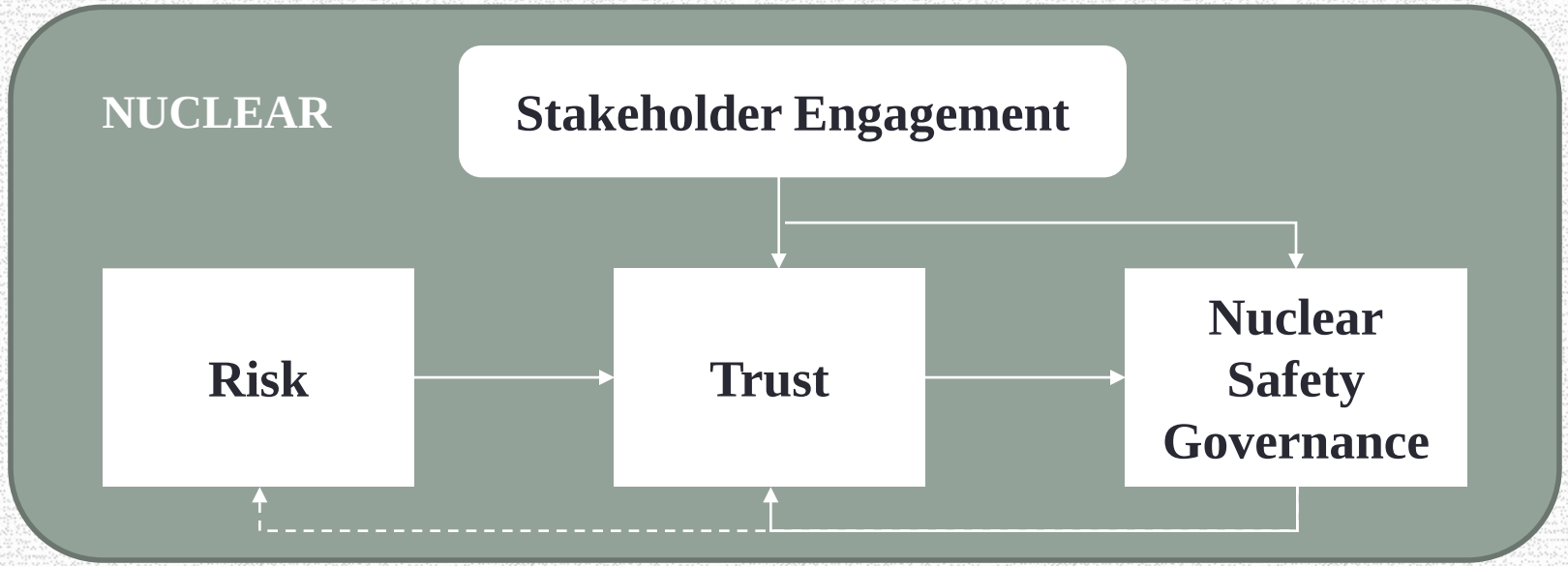
- Piecemeal and top-down
- Low flexibility, limited to local radiation monitoring
- Weak inter-departmental coordination and collaboration
- Insufficient cross-border coordination and collaboration
- Little stakeholder engagement except the experts
  - The public was not informed of contingency planning. Most citizens are not aware of such plans, nor being involved in the planning exercise.
  - Only the government departments are involved in planning and emergency response exercises.
- TRUST DEFICIT: weak stakeholder trust-building

3. Stakeholder Trust-based Model

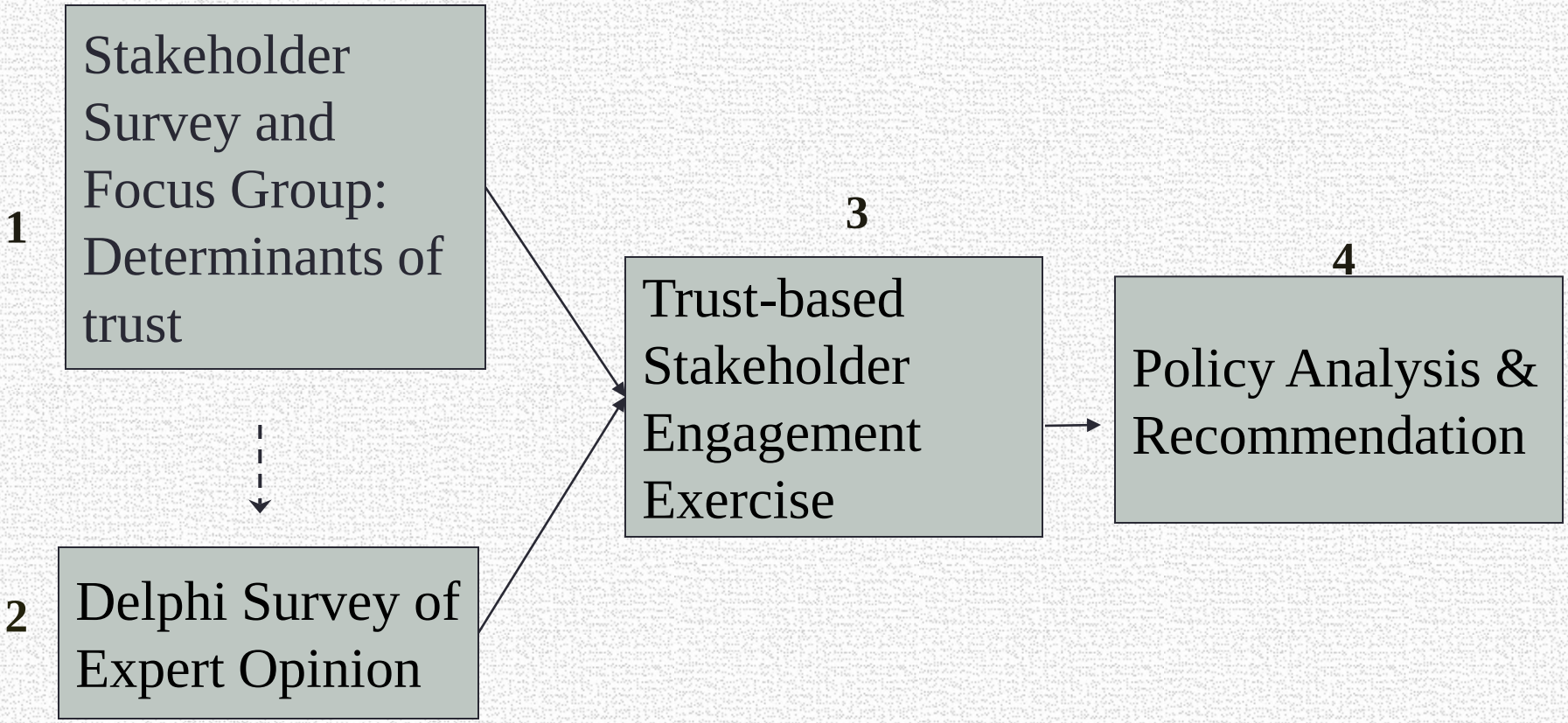
Nuclear Safety Governance

- The process of governing and managing nuclear risk by building trust in a highly complex and uncertain policy arena that places the meaningful involvement of stakeholders at its core.

Effective Nuclear Safety Governance: A Stakeholder Trust-based Model



Project Methodology



Project Objectives

1. Identify factors determining stakeholder trust in nuclear safety (contingency) governance for Hong Kong
2. Set the priorities of nuclear safety (contingency) issues for trust-building through a Delphi survey conducted among international, local and Chinese experts.
3. Solicit views and build consensus among policy makers and nuclear safety experts, together with other key stakeholders in Hong Kong and China.
4. Based on (1)-(3), recommend a trust-based NS contingency plan to the HK and Chinese government to facilitate effective NS governance.

Significance

- A novel 3-stage methodology to engage stakeholders and build stakeholder trust in nuclear safety governance

- Develop a stakeholder trust-based framework for nuclear safety governance for HK and Guangdong
  - Through examination of the determinants of trust in TWO new arenas: (i) Nuclear safety & (ii) Cross-border governance

- Extend the stakeholder trust-based model to related public policy areas (e.g. new energy development)

Characteristics of the Project

- Stakeholder engagement trust-based model for HK
- Highly **interdisciplinary** policy research
- Provide evidence to contingency planning in relation to:
  1. Public health,
  2. Food and water safety, and
  3. Cross-border collaboration

Synergy of Interdisciplinary Team

PI-Principal Investigator

Hills: Prof. Peter Hills (HKU) – Environmental Policy and Governance

SSP- Social Science & Policy

Hills: Prof. Peter Hills (HKU) – Environmental Policy & Governance

Walker: Prof. R.M. Walker (CityU) – Public Management

Lam: Dr. J.C.K. Lam (HKU) – Environmental Policy

SEM- Science, Engineering & Medicine

Leung[1]: Prof. D.Y.C. Leung (HKU) – Nuclear Engineering Safety, Radioactive Dispersion

Cheung: Prof. K.P. Cheung (HKU) – Crisis Management, Plant Design & Operation

Leung[2]: Dr. J.K.C. Leung (HKU) – Radiation Protection

Yeung: Prof. D.W.C. Yeung (HKU) – Nuclear Medicine

KE- Knowledge Exchange

Cheung: Prof. K.P. Cheung (HKU)

Fok: Dr. Wilton Fok (HKU)

AC- Advisory Committee

Li: Prof. Victor O.K. Li (HKU) – Expertise, Input, & Resource Support

Leung[3]: Ir. E.K.H. Leung – Power Utilities and Energy Policy

Chan: Ir. S.H. Chan – Nuclear Safety Operation and Management

Tsui: Ir. Dr. H. Tsui – Nuclear Engineering

Acknowledgments

- Special thanks go to Ms. Ching-wah Chan, MSc in Env Mgt, HKU, and Mr. Jeffrey Chung, Research Assistant, CUHK, for their help in newspaper text analyzes.

- Courtesy of slides on background information, contributed by Prof. Dennis Leung, Professor, Department of Mechanical Engineering, HKU; and a slide on Daya Bay Contingency Plan of HKSAR, contributed by Mr. SH Chan, Managing Director, Hong Kong Nuclear Investment Company; CLP Nuclear Investment Co.

- The project is funded by Research Grants Council - Strategic Public Policy Research (7002-SPPR-11), also supported by Initiative on Clean Energy and the Environment, an interdisciplinary research network, HKU

THANK YOU!
Please send your comments to:

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