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From Research to Policy Recommendations - A Scientometric Case Study of Air Quality Management in the Greater Bay Area, China

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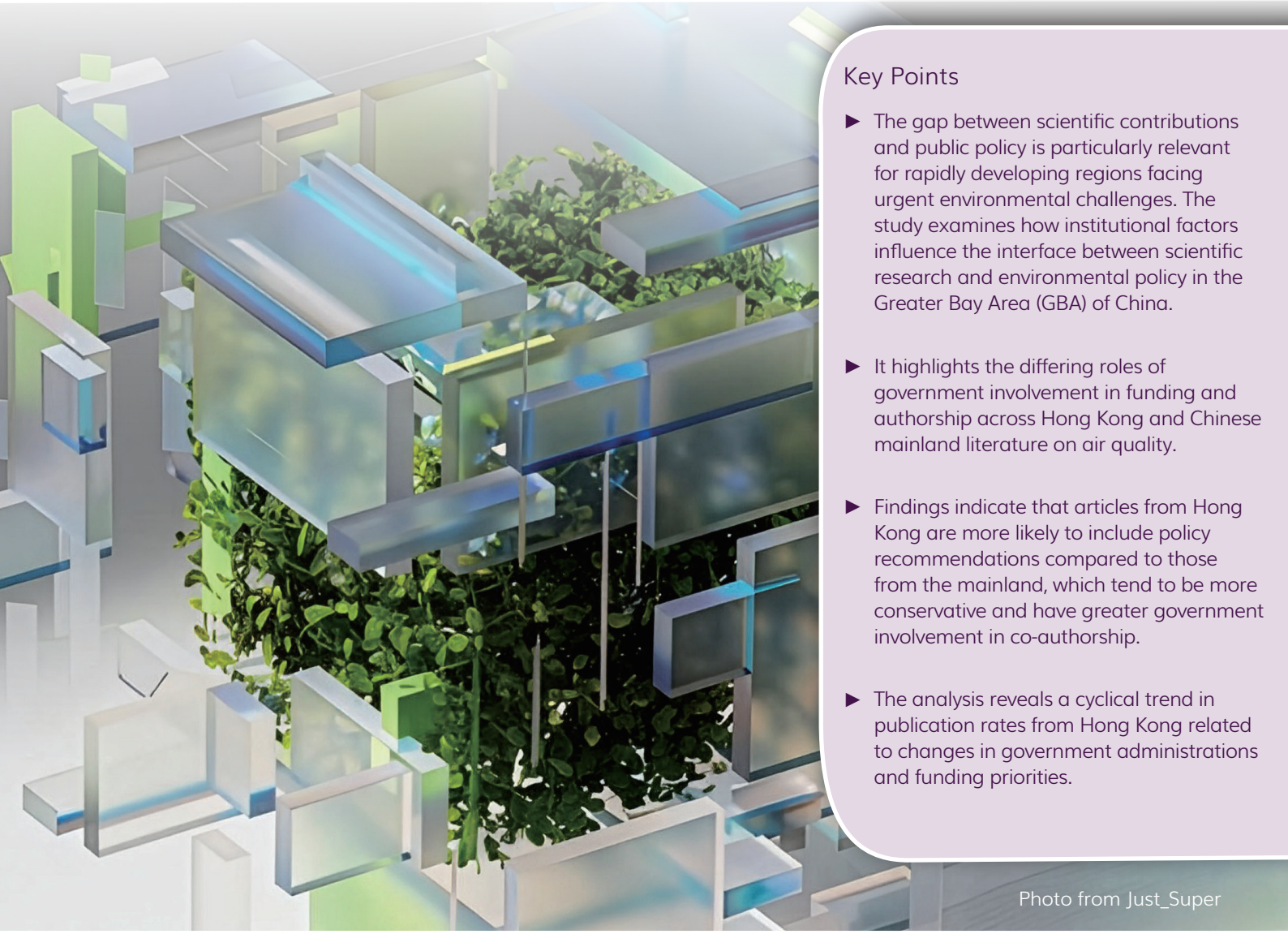

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Key Points

- The gap between scientific contributions and public policy is particularly relevant for rapidly developing regions facing urgent environmental challenges. The study examines how institutional factors influence the interface between scientific research and environmental policy in the Greater Bay Area (GBA) of China.
- It highlights the differing roles of government involvement in funding and authorship across Hong Kong and Chinese mainland literature on air quality.
- Findings indicate that articles from Hong Kong are more likely to include policy recommendations compared to those from the mainland, which tend to be more conservative and have greater government involvement in co-authorship.
- The analysis reveals a cyclical trend in publication rates from Hong Kong related to changes in government administrations and funding priorities.

Policy Focus

Air quality management in the Greater Bay Area (GBA) of China's Pearl River Delta faces complex challenges due to its unique governance structure under the "One Country, Two Systems" framework. This study investigates how scientific research informs environmental policy and the dynamics of this interaction, because the rapidly developing region faces urgent air pollution challenges. Understanding the science-policy interface is crucial for effective environmental governance and achieving better air quality outcomes.

Study Methodology

This study employs a comprehensive scientometric meta-analysis to examine the contributions of scientific research to air quality management in the GBA. It focuses on both Chinese and English-language publications from 2000 to 2019, encompassing a range of articles that meet specific criteria related to air pollution and its management. A detailed database was compiled, which includes articles analyzed for their funding sources, institutional affiliations, and policy content. By utilizing a manual

coding approach, the researchers were able to capture nuanced characteristics often overlooked in automated analyses, such as the extent of government involvement in research and the nature of policy recommendations made within the studies. This methodology allows for a deeper understanding of how institutional factors, including political systems and funding arrangements, shape the science-policy interface in the context of environmental governance in the GBA.

Findings and Analysis

Institutional Influence

The analysis reveals a stark contrast in contributions to air quality policy between Hong Kong and mainland China. English-language articles focused on Hong Kong demonstrate a significantly lower incidence of government co-authorship compared to their mainland counterparts. This relative independence from government influence coincides with researchers in Hong Kong proposing more innovative and forward-thinking policy recommendations. In contrast, studies from mainland China, which often feature greater government involvement, tend to adopt a more conservative approach. This dynamic suggests that the degree of studies published but also the boldness of recommendations made.

Cautious Recommendations

A notable finding is the cautious nature of policy recommendations within the Chinese literature. Chinese articles are less likely to even have policy recommendations, particularly when they receive government funding or have government co-authors. This result reflects mainland China's tendency towards top-down agenda-setting in both research and policy planning. This leads to greater collaboration between academic scientists and government and government-sponsored research institutes, at the potential expense of less public transparency in the policy of discourse.

Table 1
Summary statistics for all dependent and explanatory variables.

Variable name	Description	all observations n = 687 Mean (SD)	Chinese articles n = 378 Mean (SD)	English (HK) articles n = 309 Mean (SD)
HKEN	indicator, Engiish article on HK	0.45 (0.5)		
POLR	indicator, policy recommendation	0.24 (0.43)	0.21 (0.41)	0.28 (0.45)
NUPR	nuıaber ot policy recommendations	0.41 (0.93)	0.42 (1.06)	0.39 (0.75)
AUGN	indicator, government co-authorship	0.57 (0.5)	0.78 (0.41)	0.32 (0.47)
NATF	indicator, national government funding (all)	0.5 (0.5)	0.66 (0.47)	0.29 (0.46)
NAOF	indicator, aational government funding (non-China)	0.02 (0.14)	0 (0)	0.042 (0.2)
PROF	indicator, provincial government funding (all)	0.39 (0.49)	0.27 (0.44)	0.53 (0.5)
PHKF	indicator, HK Government funding	0.23 (0.42)	0.01 (0.1)	0.5 (0.5)
CITF	indicator, clty government funding	0.11 (0.31)	0.18 (0.38)	0.02 (0.14)
UNIF	indicator, university funding	0.18 (0.38)	0.04 (0.2)	0.34 (0.48)
NGOF	indicator, NGO funding	0.03 (0.16)	0.02 (0.13)	0.039 (0.19)
OTHF	indicator, other funding	0.01 (0.1)	0.005 (0.07)	0.016 (0.13)
YRC1	indicator, published in 2000–2004	0.15 (0.36)	0.07 (0.25)	0.25 (0.43)
YRC2	indicator, published ia 2005–2009	0.21 (0.41)	0.2 (0.4)	0.22 (0.41)
YRC3	indicator, publiished in 2010–2014	0.36 (0.48)	0.41 (0.49)	0.3 (0.46)
YRC4	indicator, published ia 2015–2019	0.28 (0.45)	0.32 (0.47)	0.23 (0.42)
PM2.5	indicator, article concerns $PM_{2.5}$	0.47 (0.5)	0.54 (0.5)	0.38 (0.49)
PM10	indicator, article concerns PM_{10}	0.46 (0.5)	0.49 (0.5)	0.42 (0.49)
SO2	indicator, article concerns SO_2	0.39 (0.49)	0.45 (0.5)	0.32 (0.47)
NOX	indicator, article concerns NO_x	0.39 (0.49)	0.42 (0.49)	0.37 (0.48)
O3	indicator, article concerns O_3	0.3 (0.46)	0.35 (0.48)	0.25 (0.43)
CO	indicator, article concerns CO	0.3 (0.46)	0.21 (0.41)	0.42 (0.49)
VOC	indicator, article concerns VOCs	0.28 (0.45)	0.17 (0.38)	0.41 (0.49)
AQI	indicator, article concerns AQI	0.09 (0.28)	0.12 (0.32)	0.05 (0.22)
TYPE1	indicator, new policy proposal	0.06 (0.24)	0.037 (0.19)	0.09 (0.29)
TYPE2	indicator, critiqne of existing policy	0.03 (0.17)	0.019 (0.13)	0.04 (0.20)
TYPE3	indicator, improvement to existing policy	0.15 (0.36)	0.15 (0.36)	0.14 (0.35)

Cyclical Publication Trends

The study also reveals cyclical patterns in the publication rates of English-language articles from Hong Kong, which roughly correspond with changes in Hong Kong Special Administrative Region Government administrations. Peaks in publication activity often occur following transitions in political leadership of the Chief Executive, indicating that researchers may need to adapt their work to the funding and other priorities determined by each administration. This responsiveness highlights the interconnectedness between political cycles and research output, suggesting that the scientific community in Hong Kong not only tries to influence existing policies but also responds in turn to shifting political landscapes.

Recommendations

Foster Interdisciplinary Collaboration

Establishing robust partnerships between scientists, policymakers, and stakeholders can increase the scientific

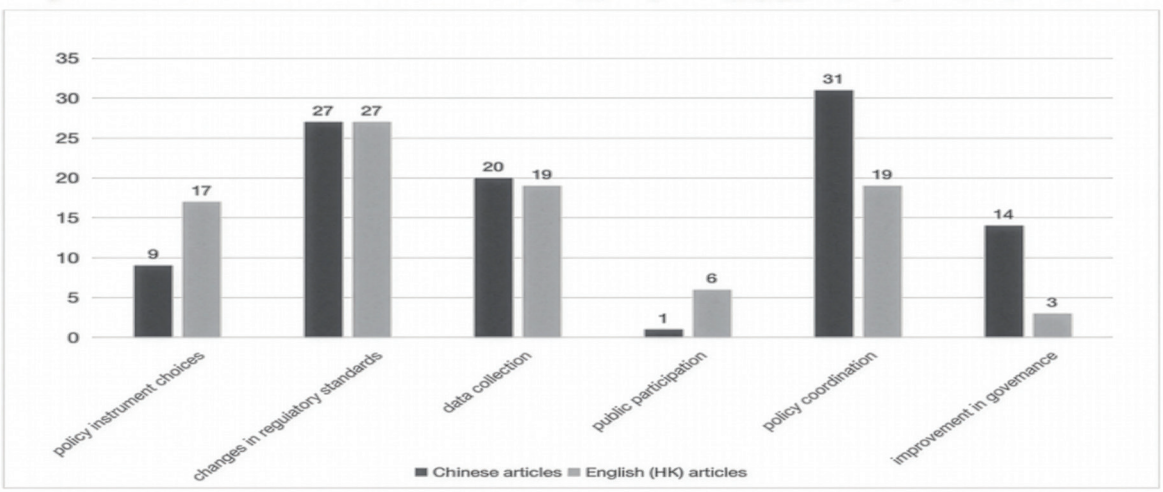

Fig. 11. Number of articles containing each of six specific types of policy recommendations.

Table 7
Results of multinomial logistic regression on TYPE, the broad category of policy recommendation within the article. *p < 0.05. **p < 0.01. ***p < 0.001.

	All articles		
	1 TYPE= 1 Coefficient (Robust SE)	2 TYPE= 2 Coefficient (Robust SE)	3 TYPE= 3 Coefficient (Robust SE)
HKEN	1.32 (0.39)**	1 (0.51)	0.27 (0.26)
NAOF	−0.28 (1.04)	−32.6 (0.64)***	0.34 (0.75)
CITF	0.29 (0.62)	−31.78 (0.46)***	0.23 (0.35)
YRC4	0.6 (0.38)	1.16 (0.48)*	0.8 (0.27)**
PM2.5	−0.3 (0.34)	0.17 (0.43)	−0.49 (0.24)*
SO2	0.008 (0.38)	−0.15 (0.49)	0.69 (0.25)**
O3	0.69 (0.38)	1.05 (0.44)*	0.34 (0.26)
CO	−0.016 (0.34)	−0.97 (0.6)	−0.67 (0.27)*
VOCS	−0.89 (0.4)*	0.27 (0.47)	−0.16 (0.27)
AQI	−0.19 (0.55)	−32.22 (0.43)***	−0.79 (0.45)
constant	−3.31 (0.46)***	−4.18 (0.5)***	−1.93 (0.25)***
	Chinese articles only		
	4 TYPE= 1 Coefficient (Robust SE)	5 TYPE= 2 Coefficient (Robust SE)	6 TYPE= 3 Coefficient (Robust SE)
PHKF	−34 (0.72)***	−33.52 (0.97)***	−34.29 (0.54)***
CITF	0.26 (0.79)	−33.63 (0.53)***	0.25 (0.37)
UNIF	−34.07 (0.41)***	−32.69 (0.7)***	−0.2 (0.77)
YRC4	0.84 (0.62)	2.37 (0.83)**	0.41 (0.34)
PM10	0.86 (0.57)	2.2 (1.07)*	0.066 (0.29)
VOCS	−34.4 (0.35)***	0.21 (0.84)	0.02 (0.38)
AQI	−1.26 (1.04)	−34.61 (0.53)***	−0.63 (0.54)
constant	−3.51 (0.5)***	−6 (1.13)***	−1.77 (0.25)***
	HK articles only		
	7 TYPE= 1 Coefficient (Robust SE)	8 TYPE= 2 Coefficient (Robust SE)	9 TYPE= 3 Coefficient (Robust SE)
NAOF	−0.22 (1.09)	−33.42 (0.53)***	0.43 (0.77)
CITF	0.76 (1.14)	−33.11 (0.72)***	0.29 (1.01)
YRC3	0.65 (0.49)	−0.087 (0.75)	1.1 (0.44)*
YRC4	0.79 (0.51)	0.7 (0.69)	1.43 (0.47)**
PM10	−0.057 (0.45)	−0.23 (0.62)	0.89 (0.38)*
O3	1.28 (0.47)**	1.27 (0.62)*	1.15 (0.4)*
AQI	0.49 (0.71)	−33.76 (0.5)***	−1.33 (1)
constant	−2.88 (0.42)***	−3.13 (0.48)***	−3.2 (0.45)***

validity of policies for mitigating complex environmental problems like air pollution. This collaboration should include regular communication channels and joint initiatives that allow for the integration of scientific findings into policy formulation. Interdisciplinary teams can bring together diverse perspectives to address complex air quality issues more holistically. However, independence of scientific inquiry from government control is also vital for transparent and informed public policy discourse.

Enhance Public Engagement

Enhanced transparency creates space for civil society engagement to drive research directions that contribute to public policy formulation and prioritization. Making air pollution data publicly available is key to enhancing the ability of scientists and other civil society institutions to independently develop solutions. Additionally, transparent and participatory approaches that involve diverse perspectives also enhance policy innovation.

Implement Comprehensive Policy Evaluation Frameworks

Establishing formal systems for ex-post evaluation of environmental policies is vital. These frameworks should assess the effectiveness of implemented policies in achieving air quality goals and identify areas for improvement. Regular evaluations can provide critical feedback for ensuring that policies remain adaptive and responsive to emerging scientific evidence and public needs.

Main Reference
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