



## AESC Working Paper 28

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### **Supplementary notes to the Paper “Understanding smart energy transitions as a new source of distrust: The perspectives of Hong Kong citizens on the risks of regional inter-city energy collaboration in the Guangdong-Hong Kong-Macau Greater Bay Area (GBA)”**

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Publication Date: 06-2022

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**Supplementary notes to the Paper**  
**“Understanding smart energy transitions as a new source of distrust:  
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This paper provides the supplementary information and full list of references used for the paper “Understanding smart energy transitions as a new source of distrust: The perspectives of Hong Kong citizens on the risks of regional inter-city energy collaboration in the Guangdong-Hong Kong-Macau Greater Bay Area (GBA)”.

**Abstract**

Hong Kong has an ambitious carbon neutral goal to meet by 2050. Achieving this goal requires a departure from a traditional city-scale centralised, fossil fuel-based energy infrastructure to a more decentralised, locally-generated renewable energy (RE) while expanding regional inter-city smart grid system to accommodate RE import in the Guangdong-Hong Kong-Macau Greater Bay Area (GBA). Such energy transitions inevitable bring new social challenges, but how Hong Kong citizens perceive such transitions in the GBA context is not well studied. This study draws on quantitative and qualitative data derived from an online deliberative poll (DP) that records the opinions of 174 Hong Kong citizens on smart energy transitions. We have four key findings. Firstly, citizens showed a low level of trust to the national, provincial and city governments whilst a high level of trust towards the incumbent electricity companies. Secondly, citizens showed distrust to the governments, suspecting the genuine motives of the governments were to prioritise regional RE import over local RE production. Thirdly, citizens raised concerns over five types of risks (price volatility risks, energy reliability risks, cost overrun risks, data privacy risks and environmental risks) that contributed to new sources of public distrust in governments’

competence. Fourthly, the public distrust on multilevel governments was found underpinned by demographic factors (age group and family size) and a socio-political context of recent social movements against government policies. Our findings suggest that policymakers in the GBA need to give sufficient attention to enhancing public trust, and thereby policy legitimacy of regional smart energy transitions.

**Keywords:** Smart energy transitions; inter-city energy collaboration; public distrust; public perception of risks; Guangdong-Hong Kong-Macau Greater Bay Area (GBA)

## 1. Introduction – References

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Cities as key sustainability transition arenas to include smart grids: (Ghofrani et al., 2018; Quitzow & Rohde, 2021)

Smart grid developments – new pricing systems: (Mah et al., 2018)

Smart grid technologies’ potential: (Mah et al., 2014a)

Integrating renewable energy sources in distributed energy systems: (Brown et al., 2019; Mah et al., 2014a; Parag, 2015)

Urban energy policies at national and city levels: (Mega, 2002)

The rescaling effect of socio-technical energy transitions: (Rutherford & Coutard, 2014)

Localisation of smart energy transitions at community levels: (Mah & Cheung, 2020)

Innovative niches in distributed energy grid systems: (Coenen et al., 2010; Parag & Sovacool, 2016)

Social values creation: (Pohlmann, 2018; REN21, 2021)

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Regional cross-border energy governance: (Liu et al., 2021a)

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## 2.4. Public perception of policy issues and trust in China

- Social welfare: (Cheng & Ngok, 2020),
- Corruption: (Li et al., 2015)
- Food safety: (Han & Yan, 2019)
- Environmental risks: (Huang, 2018)
- Public trust in the central and local governments: (Han & Yan, 2019; Lü, 2012)
- Public perceptions of risks: (Huang, 2021)
- Regional factors affecting trust in the government: (Lü, 2012)
- Public trust affects the public acceptance of nuclear power: (He et al., 2013)
- Public trust affects the public acceptance of renewable energy projects: (Liu et al., 2019)
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### 3. Hong Kong and the Greater Bay Area (GBA) contexts – Tables and References

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**Table 1. Major economic and energy indicators of Hong Kong and the Greater Bay Area (GBA).**

Indicators	Hong Kong	The Greater Bay Area
Population (10,000 persons) (2020)	7,474,200	78,697,600
Population density (persons/km <sup>2</sup> ) (2020)	6,733.5	1,431.2
Area (km <sup>2</sup> ) (2020)	1,110	56,097
GDP (current; billions US\$) (2020)	345	1,424
GDP per capita (US\$) (2020)	46,088	17,712
Total electricity consumption (TWh) (2017)	44	491
Electricity per capita (kWh/capita) (2017)	5,936	7,096
Fuel mix for electricity generation (2017)	Coal (46%) Natural gas (27%) Nuclear (27%) RE (<0.01%)	Electricity import (46%) Coal (28%) Natural gas (13%) Nuclear (9%) RE (4%)

Sources: (Chung, 2019; CMAD, 2018; EMSD, 2021; Xie et al., 2020)

**Table 2. Major energy-related government plans and policies in Hong Kong and the GBA in the recent years.**

Date	Major government plans, policies and initiatives	Relevance to regional smart energy collaboration
July 2017	“Framework Agreement on Deepening Guangdong-Hong Kong-Macao Cooperation in the Development of the Greater Bay Area”	<ul style="list-style-type: none"> <li>Promote infrastructure connectivity including stable and safe energy supply system</li> </ul>
October 2018; January 2019	Feed-in-Tariff (FiT) under Scheme of Control Agreements (SCAs)	<ul style="list-style-type: none"> <li>RE generated could be sold to the power companies at a rate higher than the normal electricity tariff rate (US\$0.39-US\$0.64)</li> </ul>

February 2019	“Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area”	<ul style="list-style-type: none"> <li>• Enhance the energy supply structure and network in the GBA, and develop a clean, low-carbon, safe and efficient energy supply system</li> <li>• Strengthen energy transmission network from Guangdong to Hong Kong</li> </ul>
March 2019	Solar Harvest	<ul style="list-style-type: none"> <li>• Promote the development of local renewable energy by installing solar generation systems for eligible schools and welfare NGOs for free.</li> </ul>
October 2020	EV-charging at Home Subsidy Scheme (EHSS)	<ul style="list-style-type: none"> <li>• Subsidise the installation of EV charging-enabling infrastructure in car parks of existing private residential buildings</li> </ul>
November 2020	Carbon neutral goal	<ul style="list-style-type: none"> <li>• Strive towards Carbon Neutrality by 2050</li> </ul>
November 2020	“Long-term Decarbonisation Strategy Public Engagement”	<ul style="list-style-type: none"> <li>• Increase the proportion of zero carbon energy in our fuel mix</li> <li>• Promote and enhance the potential development of local renewable energy and waste-to-energy</li> <li>• Review the targets of local renewable energy development</li> </ul>
November 2020	Green Tech Fund (GTF)	<ul style="list-style-type: none"> <li>• Fund research and development projects which help Hong Kong’s decarbonisation and energy saving, green transport, waste management, and air and water quality</li> </ul>
December 2020	“Hong Kong Smart City Blueprint 2.0”	<ul style="list-style-type: none"> <li>• In line with “Climate Action Plan 2030+”: <ul style="list-style-type: none"> <li>○ Apply RE in a larger scale with public sector taking the lead</li> <li>○ Promote energy efficient and conservation in buildings</li> <li>○ Phase down coal-fired electricity generation</li> </ul> </li> <li>• Adopt advance pre-treatment technology for turning waste to energy</li> </ul>
March 2021	“Hong Kong Roadmap on Popularisation of Electric Vehicles”	<ul style="list-style-type: none"> <li>• No new registration of fuel-propelled private cars including hybrid vehicles in 2035 or earlier</li> <li>• Promote trials for electric public transport</li> <li>• Increase the number of charging facilities and infrastructures</li> </ul>
June 2021	“Clean Air Plan for Hong Kong 2035”	<ul style="list-style-type: none"> <li>• In line with the new low-carbon electricity generation strategy under</li> </ul>

		<p>“Hong Kong Climate Action Plan 2050”:</p> <ul style="list-style-type: none"> <li>○ Tighten emission limits of power plants</li> <li>○ Develop green energy, and take forward the use of liquefied natural gas</li> <li>● Formulate regional emission reduction targets for 2025 and 2030 with the Guangdong Province</li> </ul>
October 2021	“Hong Kong Climate Action Plan 2050”	<ul style="list-style-type: none"> <li>● Replace coal for daily electricity generation with low to zero-carbon energy by 2035</li> <li>● Increase the supply of zero-carbon electricity by 60-70% by 2035 by trial of new energy and closer collaboration with neighbouring areas</li> <li>● Increase the shares of renewable energy in the electricity mix to 7.5-10% by 2035</li> </ul>

Sources: (CMAB, 2017, 2019; Council for Sustainable Development, 2019; EMSD, 2019a, 2019b; ENB, 2021a, 2021b; ENB et al., 2021; EPD, 2021a, 2021b; ITB, 2020; Office of the Chief Executive, 2020)

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#### **5. Findings – Tables and References**

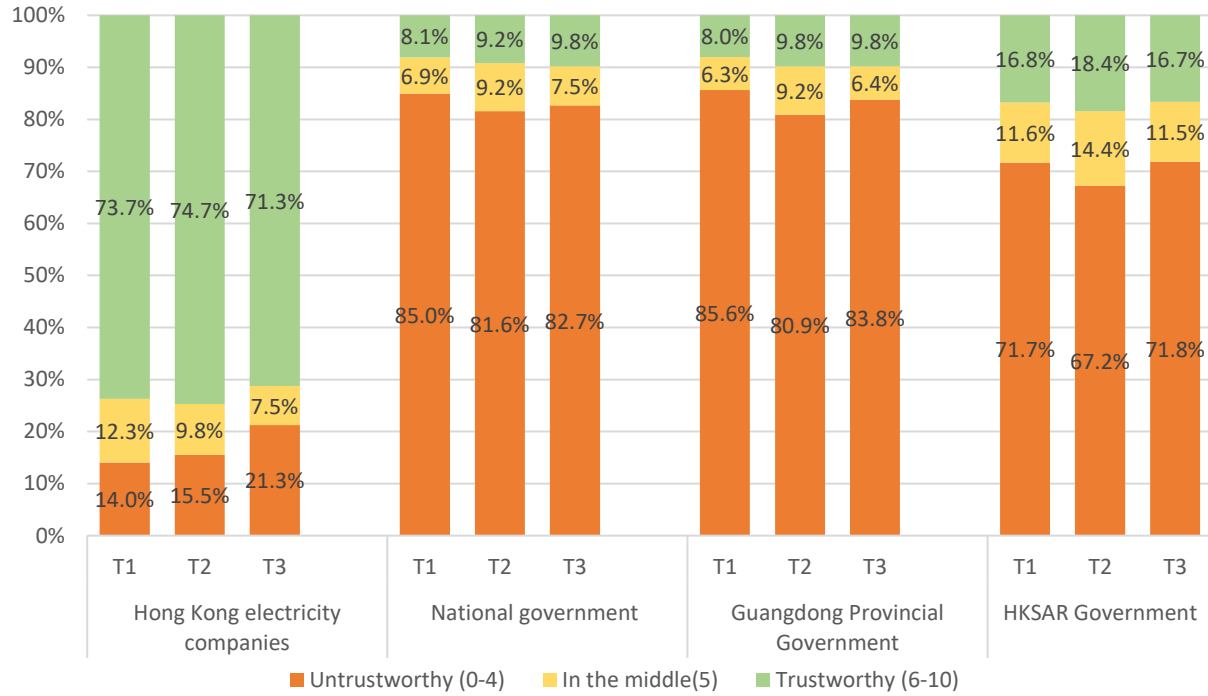
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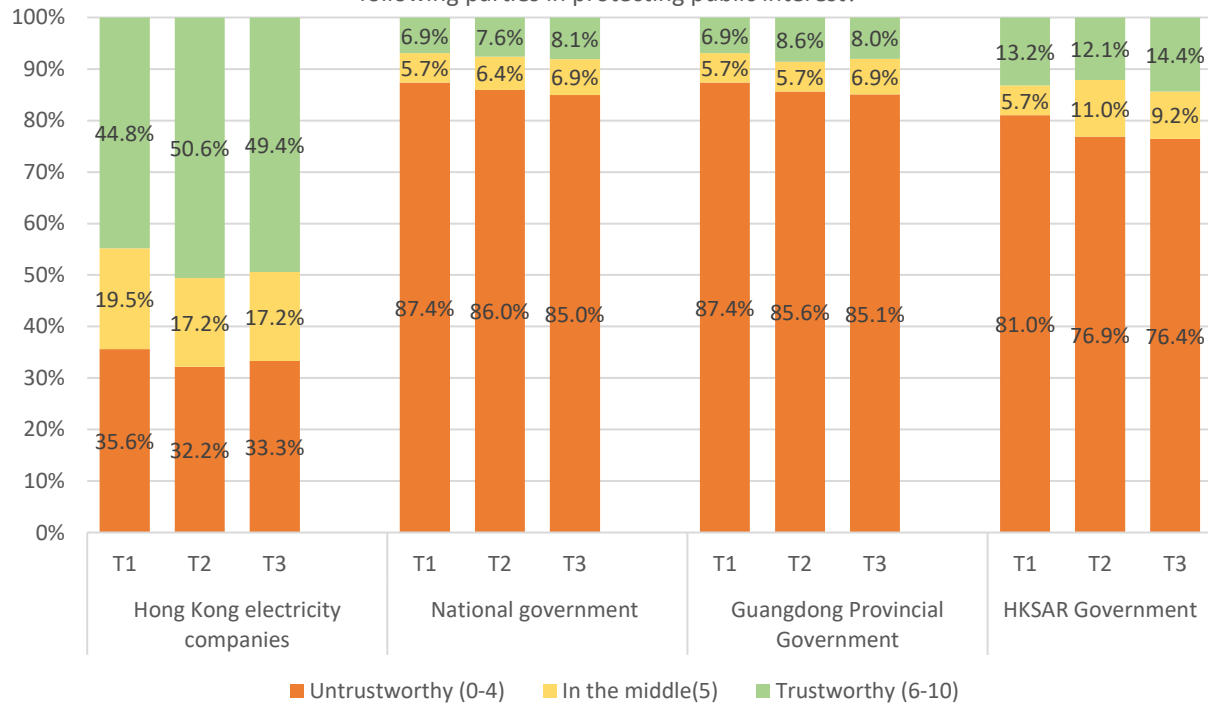
##### ***5.1 Low level of trust among different level of governments***

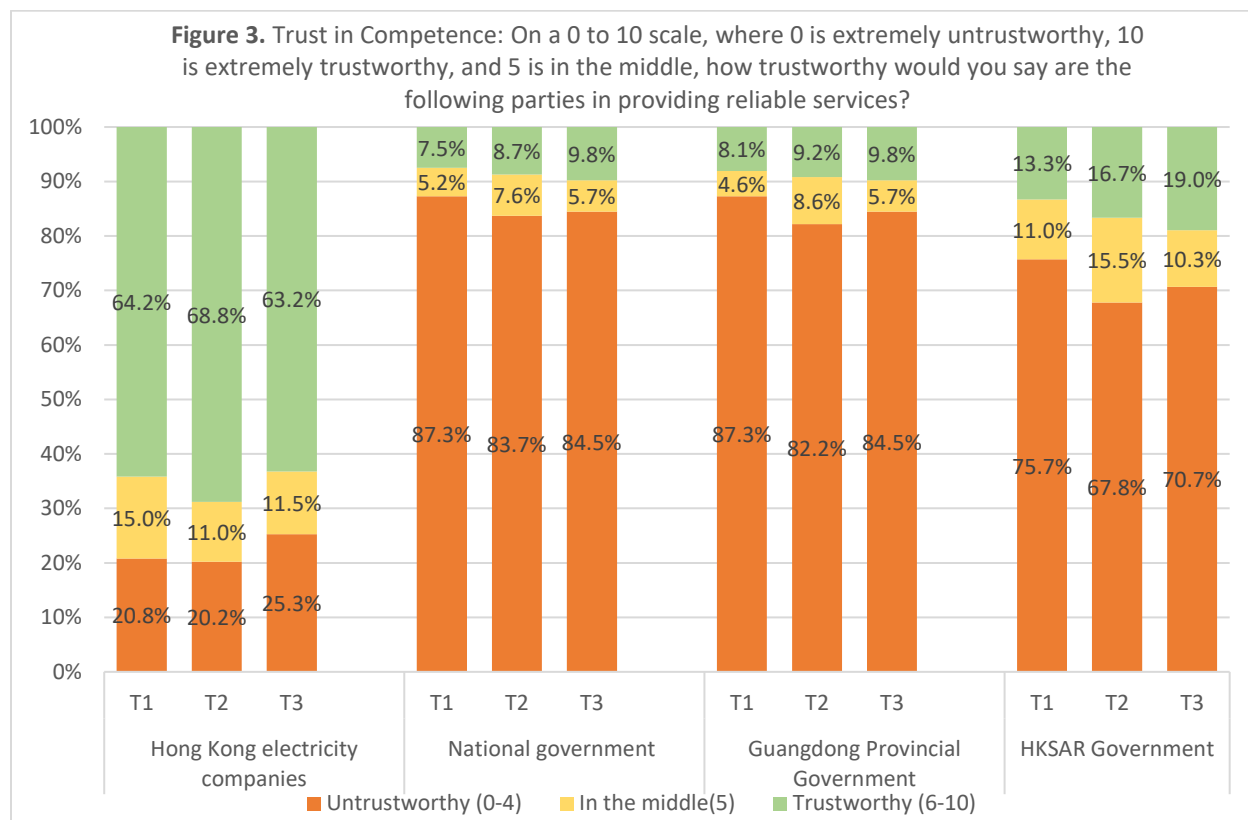
(Wang et al., 2021)

**Figure 1. Trust in Infomation:** On a 0 to 10 scale, where 0 is extremely untrustworthy, 10 is extremely trustworthy, and 5 is in the middle, how trustworthy would you say are the following parties if they collect your household energy information?



**Figure 2. Trust in Motives:** On a 0 to 10 scale, where 0 is extremely untrustworthy, 10 is extremely trustworthy, and 5 is in the middle, how trustworthy would you say are the following parties in protecting public interest?





Wang, P., Yang, M., Mamaril, K., Shi, X., Cheng, B., & Zhao, D. (2021). Explaining the slow progress of coal phase-out: The case of Guangdong-Hong Kong-Macao Greater Bay Region. *Energy policy*, 155, 112331. doi:10.1016/j.enpol.2021.112331

## 5.2 Distrust in governments' motives in prioritising local RE production over regional RE import

(CMAB, 2018; HK Electric, 2019; NEA, 2019) (NEA, 2021)

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### 5.3 Five major risks as new sources of public distrust in governments' competence

(Legislative Council, 2020) (NCSC, 2017) (DSEPDR, 2018) (Environmental Protection Bureau, 2021) (Government Information Centre, 2017a; Legislative Council, 2021a)

**Table 3. Risks in smart energy transitions in regional context.**

Risks in energy import from the GBA	Quotes
Price volatility risks	<p>“... In addition, in the case of electricity supply in the mainland, the problem is that their cost might be \$1, but they might sell to us for \$5 or \$10. To illustrate, Dongjiang water is a perfect example.” (1n)</p> <p>“... it mentioned that we have to compete with buyers in other regions for buying the certificates to supply electricity. So it will be affected by market fluctuations, this is what the public care about the most. It is because they don't want to see the price fluctuate day by day, or in short, it affects the costs when they use it...” (1a)</p>
Energy reliability risks	<p>“...we can compare it with Macau. Most of their electricity comes from Southern Power Grid. Last time, when the typhoon came, they suffered a long time of power outage. We should be cautious.” (1d)</p>
Costs overruns risks	<p>“...Because the cost of transmission can be high as well. So we have to examine if the cost of developing locally is really more expensive than importing from the Mainland; around the same or just slightly more expensive. I think we should develop solar in Hong Kong...” (1b)</p> <p>“...Why would you need to purchase more electricity from the mainland, China? There would be a great amount of energy loss during transmission, so it is much better to produce and consumer locally.” (1k)</p>
Data privacy risks	<p>(On solar development in general) “I think when it is the time to open the electricity use data, it will involve privacy, and I believe the electricity companies will then link it to the issue of opening up the grid. It is through opening up the grid the electricity companies can have a reason or an excuse to open the data. If there are something like apps or measures to monitor the solar systems, it is good. However, it is also hard to avoid if someone will falsify the data in the absence of a highly credible monitoring agency.” (2f)</p> <p>“In fact, if we talk about privacy, the issue is always present. It is because all the personal and family data have already been stored in the utilities or electricity companies. If a certain agency wants to hack the database, it can do so now anyway. Thus, there is no</p>

	way to stop the government from monitoring, and probably the government would pay great effort in monitoring the data...” (2f)
Environmental risks	“I strongly oppose buying electricity from the Greater Bay Area. Because, first, their infrastructure may destroy the ecology...” (1j)

Sources: Authors; data compiled from Hong Kong online DP

DSEPDR. (2018). *Typhoon Hato Disaster Risk Assessment And Suggestion On Emergency Response System Optimization Report* (《澳門“天鴿”颱風災害評估總結及優化澳門應急管理體制建議》報告). Macau: Direcção dos Serviços de Estudo de Políticas e Desenvolvimento Regional Retrieved from <https://www.dsepr.gov.mo/uploads/attachment/2020-05/827cd17ec92228c657ec185036a29c90.pdf>.

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## Acknowledgements

The first two authors have equally contributed to the manuscript. The authors would like to thank the Hong Kong Baptist University's Initiation Grant for Faculty Niche Research Areas (project titled "Trust and the Smart City" – Project No. RC-FNRA-IG/19-20/SOSC/01); the Hong Kong Special Administrative Region Research Grants Council's General Research Fund (project titled "Deliberative participation, trust, and social learning for sustainable energy transitions (SETs): A comparative study of Japan, South Korea, and China" – Project No. 12602717); the Hong Kong Special Administrative Region Research Grants Council's Research Impact Fund (project titled "Exploring the role of big data analytics in promoting smart low-carbon cities: A human-centered, community-based, and deep engagement approach in Hong Kong" – Project No. R2002-20); and the Hong Kong Baptist University's Social Sciences Faculty Research Grant (projects titled "The diversity and critical processes of urban energy transitions through community engagement: An

international comparison of London, Freiburg (Germany), New York City, Tokyo, Seoul, Hong Kong and Foshan (China)” – Project No. FRG2/17-18/096) for providing the funding support. The author would also like to acknowledge our appreciation to Mr. Martin Cheng of the Asian Energy Studies Centre at Hong Kong Baptist University for his research support.

**Appendix 1. Pearson Correlations of Trust in information and Hong Kong citizens' demographic factors.**

	Age Group	Number of Family Members	Number of Children	Education Level	Income Level	Highest Monthly Tariff
T1 - Major utilities	.085	-.033	-.075	-.022	.009	.006
T1 - National Government	<b>.156*</b>	.094	<b>.155*</b>	-.071	-.075	-.085
T1 - Guangdong Provincial Government	<b>.175*</b>	.093	<b>.153*</b>	-.039	-.086	-.086
T1 - Hong Kong Government	<b>.218**</b>	-.021	.056	-.006	-.077	-.096
T2 - Major utilities	<b>.175*</b>	-.105	-.073	-.054	.011	<b>-.179*</b>
T2 - National Government	.128	.093	.083	.009	-.078	-.093
T2 - Guangdong Provincial Government	.117	.121	.103	-.003	-.089	-.101
T2 - Hong Kong Government	<b>.240**</b>	.013	.025	-.099	.015	-.106
T3 - Major utilities	.096	.021	-.011	-.029	-.080	-.071
T3 - National Government	.131	<b>.171*</b>	<b>.172*</b>	-.020	-.116	-.092
T3 - Guangdong Provincial Government	.127	<b>.160*</b>	<b>.173*</b>	.002	-.084	-.107
T3 - Hong Kong Government	<b>.153*</b>	.113	.111	-.071	-.053	-.072

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

**Appendix 2. Pearson Correlations of Trust in motives and Hong Kong citizens' demographic factors.**

	Age Group	Number of Family Members	Number of Children	Education Level	Income Level	Highest Monthly Tariff
T1 - Major utilities	.144	-.049	-.048	-.013	.063	-.008
T1 - National Government	.112	.102	.120	-.043	-.104	-.048
T1 - Guangdong Provincial Government	.116	.088	.130	-.018	-.148	-.069
T1 - Hong Kong Government	<b>.185*</b>	.005	.017	-.036	-.085	-.095
T2 - Major utilities	.123	-.014	.028	-.037	.059	<b>-.191*</b>
T2 - National Government	.127	.106	.088	-.026	-.085	-.097
T2 - Guangdong Provincial Government	.126	.110	.096	-.004	-.115	-.106
T2 - Hong Kong Government	<b>.185*</b>	.024	.059	-.061	.043	-.065
T3 - Major utilities	.098	.053	.070	.014	-.134	<b>-.169*</b>
T3 - National Government	.096	<b>.176*</b>	<b>.170*</b>	-.050	-.128	-.102
T3 - Guangdong Provincial Government	.078	<b>.180*</b>	<b>.189*</b>	-.030	<b>-.153*</b>	-.103
T3 - Hong Kong Government	.137	.112	.090	-.093	-.080	-.096

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

**Appendix 3. Pearson Correlations of Trust in competence and Hong Kong citizens' demographic factors.**

	Age Group	Number of Family Members	Number of Children	Education Level	Income Level	Highest Monthly Tariff
T1 - Major utilities	-.033	-.071	-.063	-.084	.068	-.009
T1 - National Government	.123	.060	.110	-.031	-.125	-.066
T1 - Guangdong Provincial Government	.121	.067	.112	-.036	-.132	-.066
T1 - Hong Kong Government	.096	.039	.006	-.089	-.089	-.060
T2 - Major utilities	.024	.025	-.022	-.038	.013	<b>-.150*</b>
T2 - National Government	.067	.123	.080	-.088	-.089	-.073
T2 - Guangdong Provincial Government	.074	.120	.079	-.085	-.116	-.074
T2 - Hong Kong Government	.125	.037	.031	-.093	-.043	-.074
T3 - Major utilities	.089	-.009	.075	-.024	-.065	-.077
T3 - National Government	.109	<b>.166*</b>	.146	-.051	-.146	-.115
T3 - Guangdong Provincial Government	.094	<b>.172*</b>	.136	-.033	<b>-.165*</b>	-.114
T3 - Hong Kong Government	.108	.134	.051	-.109	-.081	-.065

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).