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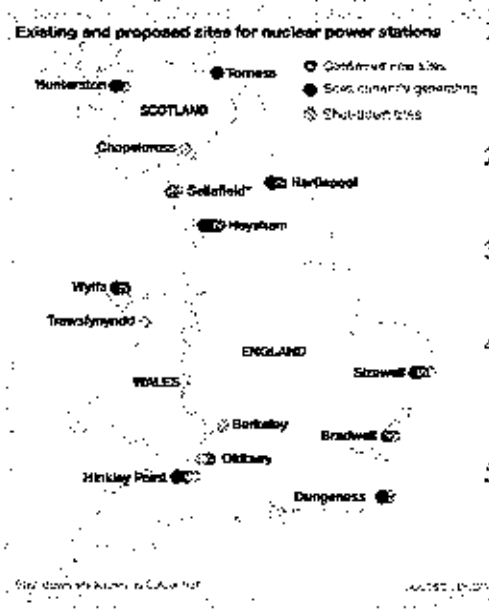
Outline

1. Background, Research Gap & Significance
2. Research Design and Questions
3. Results: Public Perception of the UK Government's Trustworthiness, Nuclear Risk, Engagement Level, Knowledge and others.
4. Statistical Analysis (Preliminary)
5. Conclusion (with Policy Implications)

1. Background

Basic Facts about Nuclear Power in UK



1. **Nuclear Energy currently supplies almost 20% of electricity in UK, but all but one plant are due to shut by 2023.**
2. There are at least 8 confirmed new sites for nuclear new build (BBC News, 2015)
3. Public support for nuclear, alongside other carbon sources, have been strong for several years.
4. Over 70% of the British public believe that nuclear should form part of the balanced energy mix for the future (YouGov, Nov 2012)
5. Maintaining public confidence in the safe operation of nuclear power plants and safety standards is critical to expansion of nuclear (NIA, 2015)

Research Significance

1. Potential risks to nuclear power includes not only natural risks but also threats such as terrorist attacks and proliferation. Since these will be first plants built in 40 years in UK, need to study public perception towards nuclear risk/safety and its link to gov't trustworthiness and effective governance.
2. By investigating determinants of government trustworthiness, we can suggest meaningful strategies to improve trust in the government.
3. Comparative study helps us understand how strategies for effective NSEG differ in different social and political contexts.

Research Gap & Novelty

1. Recent public perception studies on nuclear power/ safety has focused mainly on Risk, rather than Government Trustworthiness (Poortinga, 2003, Teravanien et al., 2011, Lei et al, 2013a, 2013b, Mah *et al*, 2014)
2. Studies on trustworthiness, has primarily focused on climate change (Pidgeon and Poortinga, 2008)
3. We offer a systematic quantitative study on nuclear safety by investigating what determines government's trustworthiness with regard to nuclear safety emergency governance.

Research Objective

1. The goal of this study is to investigate whether the public perception of government's trustworthiness in nuclear safety emergency governance in the UK can be predicted by various factors, including:
   - Perceived risk/harm of nuclear technologies
   - Knowledge about nuclear energy and safety
   - Forms and levels of stakeholder engagement that increase trust
   - Demographics
2. Results of UK will be compared with that of HK.

Trustworthiness (1)

1. Trustworthiness generally refers to an assured reliance on the character, ability, strength, or truth of someone
2. Slovic (1993): risk perception strongly associated with trustworthiness
   A. Low trustworthiness = High risk perception
   B. Ten times harder to win trust than to lose trust

Trustworthiness (2)

Metlay (1999) outlines SEVEN indicators of trustworthiness:

1. Openness – provides all relevant information
2. Reliability – tries hard to keep promises
3. Integrity – takes actions consistent with words
4. Credibility – does not distort facts to make its case
5. Fairness – is committed to impartial decision making
6. Caring – listens to concerns
7. Competence – has the necessary skills and expertise

Risk Perception -Slovic Fischhoff and Lichtenstein (1982)

1. What is risk perception research?
   - Risk perception research aims to elicit opinions about risk and provides the basis for understanding and anticipating public responses to hazards

2. Why risk perception research?
   - Risk perception is generally linked negatively to government trust/trustworthiness (Mah et al, 2014)
   - Knowledge of how people perceive risks can be used to improve the communication of risk among citizens, technical experts and policy makers

Psychometric Paradigm (1)

1. Fischhoff et al. (1978): risk perception is multidimensional

2. Risk means different things to different people - public risk perception often contrasts sharply with expert assessments of risks (e.g. experts may rate risk accordingly to mortality rates)

3. If risks are perceived to be high they are considered to be less publicly acceptable:
   - Factor 1 'threat/dreaded risk' – uncontrollable, involuntary exposure, dreaded consequences, catastrophic potential
   - Factor 2 'uncertainty/unknown risk' – novel, not experienced before, unknown to science

Psychometric Paradigm (2)

1	**Voluntariness** (voluntary-involuntary)	Do people get into the risky situations voluntarily?	Threat
2	**Immediacy of effect** (immediate-delayed)	To what extent is the risk of death immediate?	Threat
3	**Control over risk** (uncontrollable-controllable)	If you are exposed to the risk of each activity or technology, to what extent can you, by personal skill or dilligence, avoid death while engaging in the activity?	Threat
4	**Chronic-catastrophic** (chronic-catastrophic)	Is this a risk that kills people one at a time (chronic risk) or a risk that kills large numbers of people all at once (catastrophic risk)?	Threat
5	**Common-dread** (common-dread)	Is this a risk that people have learned to live with and can think about reasonably calmly, or is it one that people have great dread for – on the level of a gut reaction?	Threat

Psychometric Paradigm (3)

6 **Severity of consequences** (certain to be fatal-certain not to be fatal)	When the risk from the activity is realized in the form of a mishap or illness, how likely is it that the consequence will be fatal?	Threat
7 **Knowledge about risk** (known precisely-not known precisely)	To what extent are risks known precisely by the persons who are exposed to those risks?	Certainty
8 **Knowledge about risk** (known precisely to science-not known precisely)	To what extent are the risks known to science?	Certainty
9 **Newness** (new-old)	Are these risks new, unfamiliar ones, or old, familiar ones?	Certainty

Public Engagement (1)

1. Public engagement can take place through different mechanisms and is thought to provide a basis for increasing public trust in the governance.

2. Lofstedt (2005): public participation is seen as a prescriptive solution to public distrust particularly where risks are distributed unfairly

Public Engagement (2)

Arnstein's (1969) well known 'ladder of engagement' differentiates between lower and higher forms of engagement that vary in the level of participation and empowerment

LEVEL 8	Citizen control
LEVEL 7	Delegated power
LEVEL 6	Partnership
LEVEL 5	Concession
LEVEL 4	Consultation
LEVEL 3	Informing
LEVEL 2	Therapy
LEVEL 1	Manipulation

Knowledge

1. Sound knowledge can help the public better understand risks and prepare for emergencies (Sheppard et al. 2006)
2. However, the relationship between knowledge and risk perception is ambiguous.
3. Efforts made to 'educate' the public may not change their attitudes towards nuclear technologies (Nelkin 1974)
4. High levels of knowledge may be positively associated with high anxiety (Sundstrom et al. 1977). Low levels of knowledge may be associated with low perceived risk (Lui et al. 2008)

2. Research Design & Questions

Research Design

- Online survey administered by YouGov, a leading UK opinion research firm
- Active sampling of panel of over 360,000 participants
- Pilot survey of 200 respondents conducted in early April 2015
- Full survey of 1007 respondents conducted in mid-April 2015

Research Questions

1. What dimension(s) of trustworthiness in the UK government affect the overall perceived trust in nuclear safety emergency governance?
2. What dimension(s) of risk perception affect the overall perceived risk of nuclear radioactivity?
3. What engagement level can increase trust?
4. What predicts the overall perceived trust in government's nuclear safety emergency governance?

Survey Questions

- Part A: Perception of the UK Government's Trustworthiness in Nuclear Safety Emergency Governance (NSEG)
- Part B: Perception of Risks of Death/Harm Associated with Nuclear Radioactivity
- Part C: Levels of Engagement that Give Max. Trust in the Government's NSEG
- Part D. Knowledge Questions on Nuclear Power/ Safety
- Part E. Demographics and attitudinal questions regarding phasing out or retaining nuclear

Survey Questions (A)

Part A: Perception of the UK Government's Trustworthiness in Nuclear Safety Emergency Governance (NSEG)

- In the UK, the responsibility for nuclear safety and emergency planning in the case of a nuclear accident is shared among the industry, local government and national government agencies.

- Judging from our national government's past record of trustworthiness on public health, food, water and road safety governance, to what extent do you agree with the following statements concerning our national government's trustworthiness on Nuclear Safety Emergency Planning (NSEP)?

Survey Questions (A)

1. Openness: The gov't tells the whole truth about important activities
2. Reliability: The gov't tries hard to keep its promises
3. Integrity: The gov't takes actions consistent with its words
4. Credibility (1): The gov't takes into the account the views of scientists who disagree with it
5. Credibility (2): The gov't does not distort facts to make its case.

Survey Questions (A) – cont'd

6. Fairness: The gov't is committed to impartial decision making
7. Caring: The government listens to the concerns raised by people like you
8. Competence (1): The gov't has the necessary skills and competence to carry out its duties
9. Competence (2): The gov't is generally staffed by first class

   scientists and engineers
10. Overall, the UK government is trustworthy

Survey Questions (B)

Part B: Perception of Risks of Harm/Death Associated with Nuclear/Other Energy Generation Technologies

Threat questions (6 questions):

- **Voluntariness** (1: voluntary; 5: involuntary)

For each of the following, please indicate whether you think the risk has been imposed on you or whether you think you have had any say over the risk. Please answer the following on a scale marking 1 "Voluntary" if you think you have had some say over the risk and 5 "Involuntary" if you think the risk has been imposed on you.

Survey Questions (B) – cont'd

• **Immediacy of effect** (1: delayed; 5: immediate)

For each of the following, please indicate whether you think the risk of death/harm would happen over a long period of time or immediate? Please answer the following on a scale marking 1 if you think the risk is "Delayed" and 5 if you think the risk is "Immediate".

• **Control over risk** (1: controllable; 5: uncontrollable)

If you were exposed to each of the following, do you think you would be able to avoid the risk of death/harm through your own skills or expertise? Please answer the following on a scale marking 1 "Controllable" if you think you could avoid the risk and 5 "Uncontrollable" if you think you could not avoid the risk.

Survey Questions (B)

Part B: Perception of Risks of Harm/Death for Nuclear/Other Energy Generation Technologies

Threat questions (6 questions):

1. **Voluntariness** (1: voluntary ⟷ 5: involuntary)
2. **Immediacy of effect** (1: delayed ⟷ 5: immediate)
3. **Control over risk** (1: controllable ⟷ 5: uncontrollable)
4. **Chronic-catastrophic** (1: chronic ⟷ 5: catastrophic)
5. **Common-dread** (1: common ⟷ 5: dread)
6. **Severity** (1: certain not to be fatal ⟷ 5: certain to be fatal)

Overall Risk Perception (Threat) Scores (1: Lowest Threat; 5: Highest Threat)

Survey Questions (B)

Part B: Perception of Risks of Harm/Death for Nuclear/Other Energy Generation Technologies

Uncertainty questions (3 questions):

1. **Knowledge about risk to yourself**
   (1: known precisely ⟷ 5: not known precisely)
2. **Knowledge about risk to science**
   (1: known precisely ⟷ 5:not known precisely)
3. **Newness** (1: old⟷ 5: new)

Overall Risk Perception (Uncertainty) Scores (1: Lowest Threat; 5: Highest Threat)

Survey Questions (C)

Part C: Levels of Public Engagement (1: Lowest; 8: Highest)

Question:

Based on your experience of our national government's previous record of public health, food, water and road safety emergency planning, would your level of trust in our national government's NSEP Increase or Decrease, or No Change in the following cases?

Answers:

1. Decrease a lot
2. Decrease a bit
3. No change
4. Increase a bit
5. Increase a lot

Survey Questions (C)

Part C: Levels of Public Engagement (1: Lowest; 8: Highest)

1. People are not being engaged at all. The government and industry are solely responsible for the emergency plan. (Manipulation/Full Control)
2. People are invited to sit in the emergency planning meetings but not allowed to share their personal views. (Therapy/Comforting)
3. People are informed of the emergency plan only. (Informing)
4. People are able to sit in the emergency planning meetings and express their views but not have a right to vote on the final plan. (Consultation)

Survey Questions (C) – cont'd

5. People are being consulted and are invited to select from a few limited options.(Concession)
6. People are allowed to help develop emergency plans, but government officials reserve the right to veto their plans. (Partnership)
7. People are given some of the power to plan for the emergency, alongside industry and government. (Delegated Power)
8. People are given the full power to plan for the emergency. (Full Decision-making)

Survey Questions (D)

Part D. Knowledge Questions on Nuclear Power/Safety

1. Specific Knowledge of Nuclear Power/Safety

- What is the proportion of British electricity that is generated by nuclear power?
- Which of the following were sites of major nuclear accidents that occurred in the past? (Please tick all options that apply)

2. General Knowledge of Nuclear Power

- Which particle is larger, an electron or a neutron?
- Which material is used as fuel for producing electricity in nuclear power stations?

Survey Questions (E)

1. Demographics

Age, Gender, Personal Income, Education, Sector, Social Grade, Party, Home Ownership, Household Size, Region, Marital Status

2. Public Views on Phasing Out or Retaining Nuclear Power Plants

Currently, nuclear power accounts for 20% of electricity generation fuel mix. Which of the following comes closest to your view?

1. Nuclear power plants should be phased out completely
2. Nuclear power plants should continue to operate as they are without any being replaced
3. Nuclear power plants should continue to operate as they are but existing power plants should be retired and replaced with new ones
4. The number of nuclear power plants should be substantially increased
5. Don't know

Survey Questions (E)

3. Public Views on Phasing Out or Retaining Nuclear Power Plants

Which of the following is the current government policy?

[Similar responses to previous question]

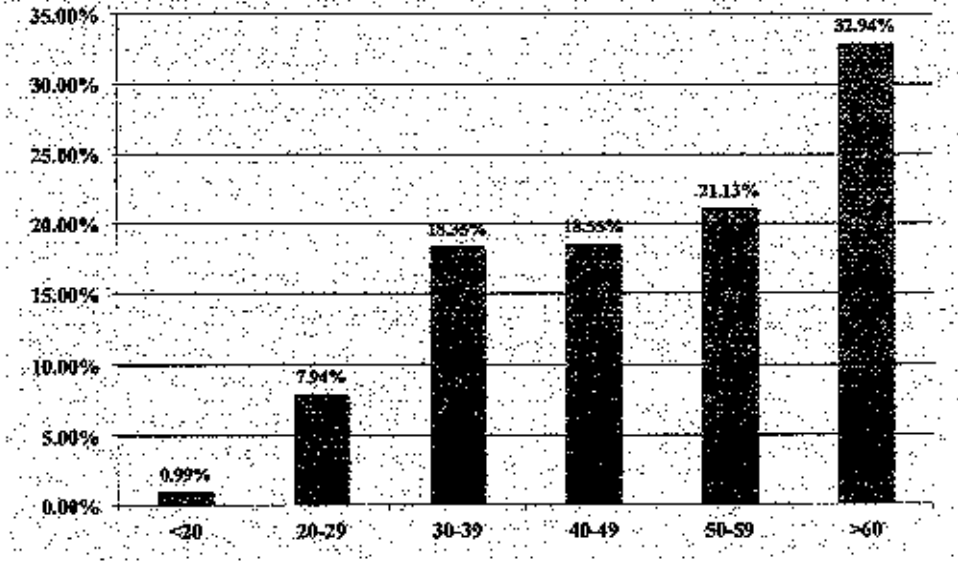
4. Public Views on Building New Nuclear Power Plants

Assume that there were plans to build a new nuclear power plant at a distance of 5 miles away from your home. How would this this make you feel?

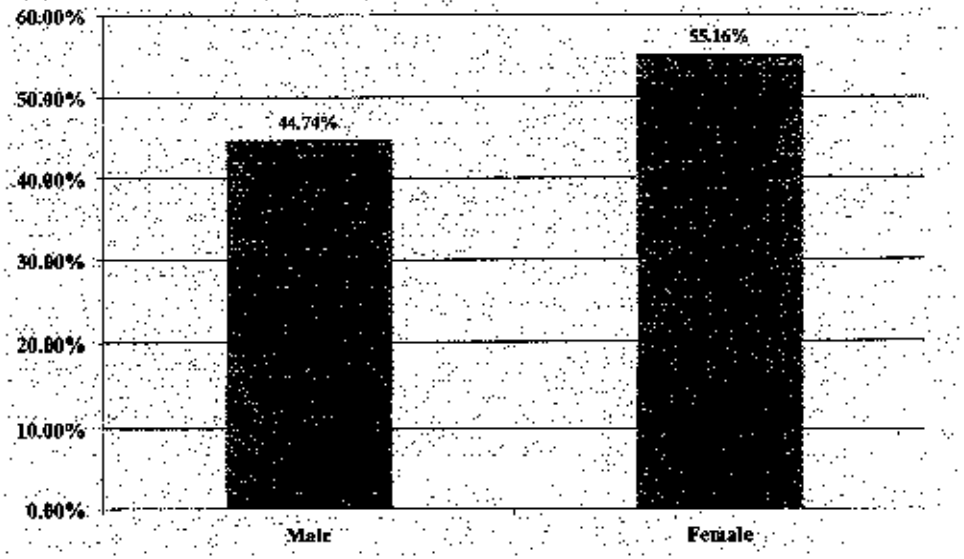
1. Very uncomfortable
2. Fairly uncomfortable
3. Neither comfortable nor uncomfortable
4. Fairly comfortable
5. Very comfortable
6. Don't know

3. Results

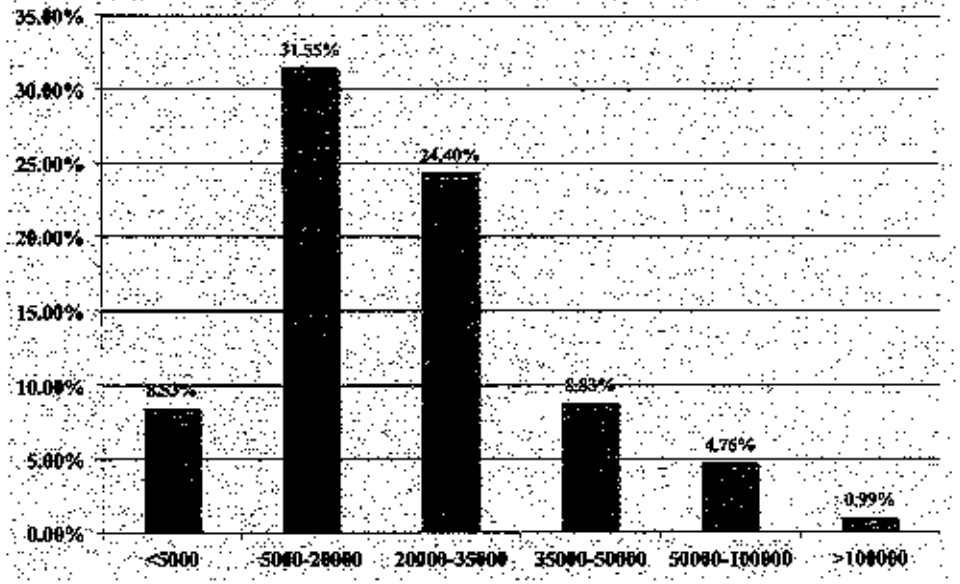
Demographics - Age



Demographics - Gender

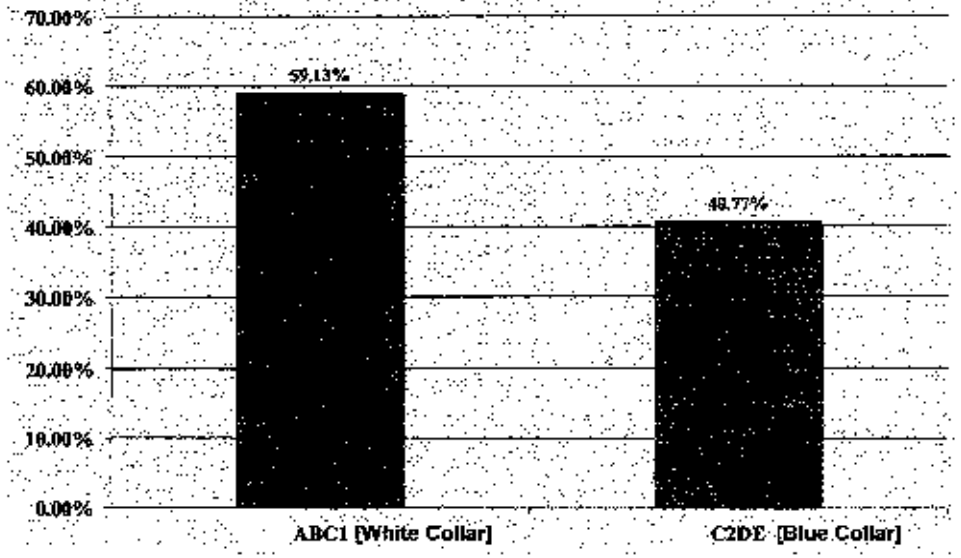


Demographics – Individual Income

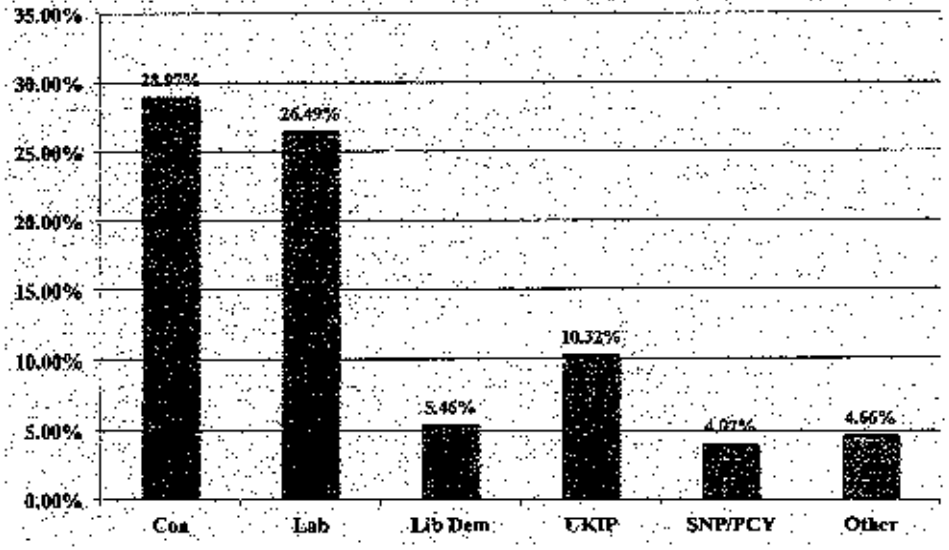


Demographics - Region

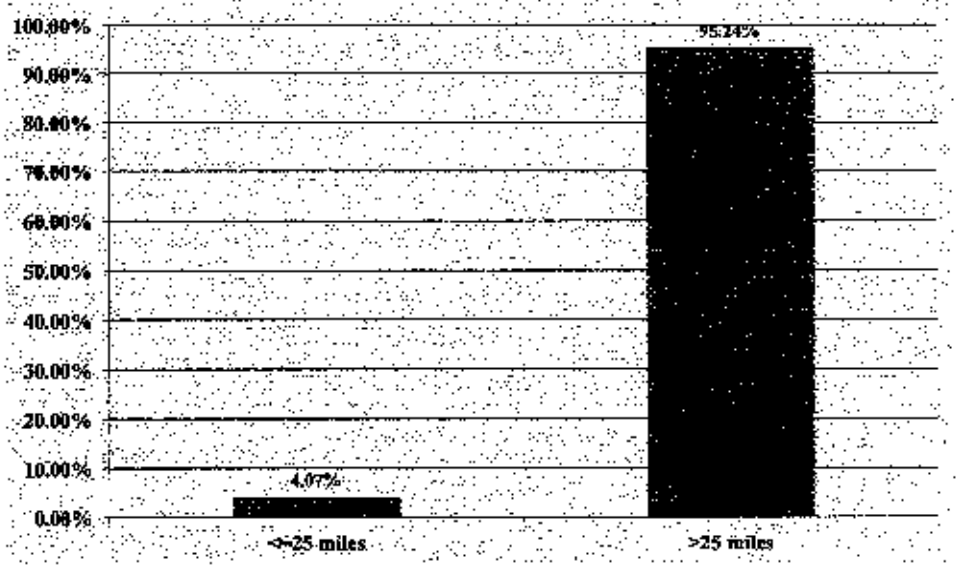
Demographics – Social Grade



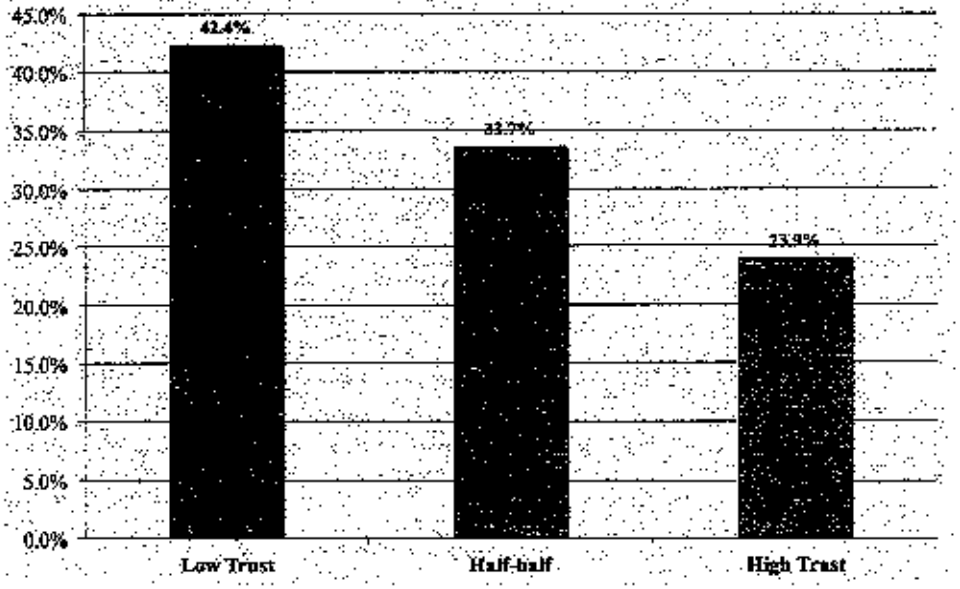
Demographics – Vote Intention



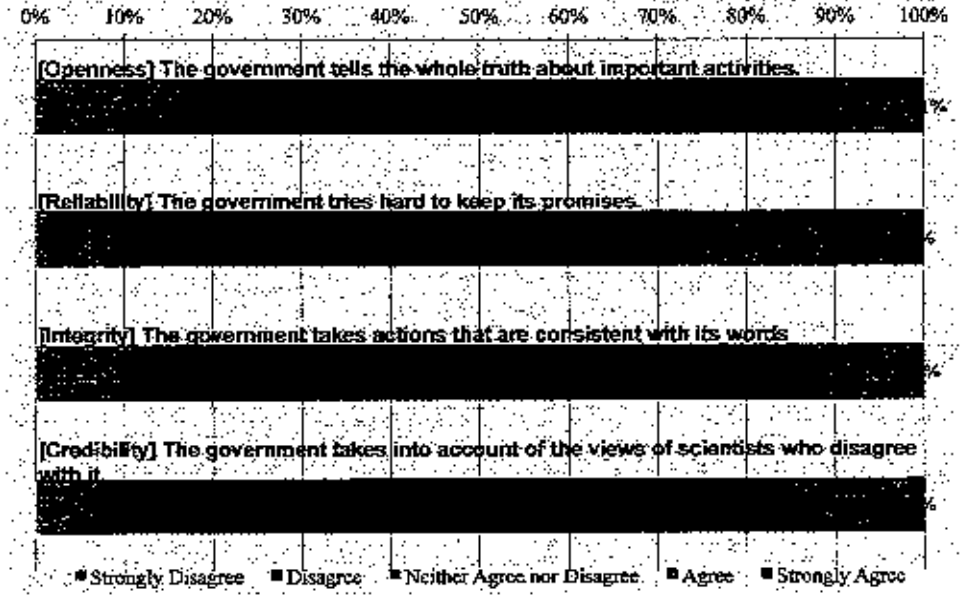
Demographics – Min Distance to Nearest NPP



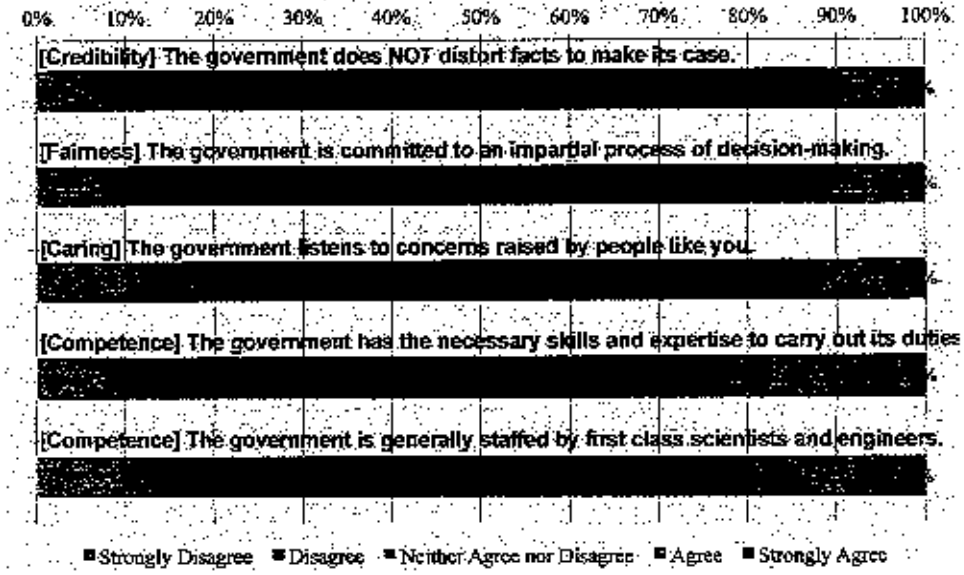
Overall Perception of Government Trustworthiness



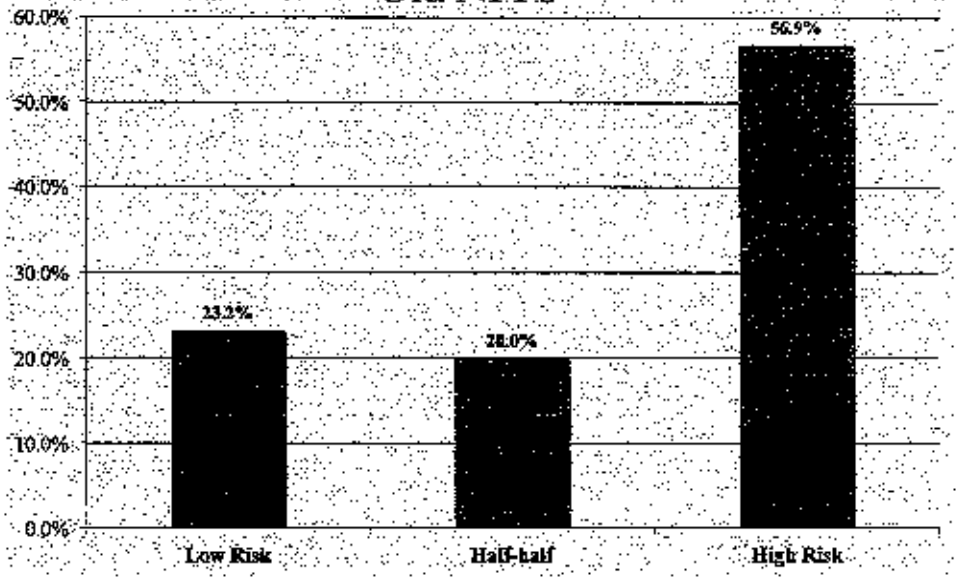
Dimension of Gov't Trustworthiness (Mean Value)



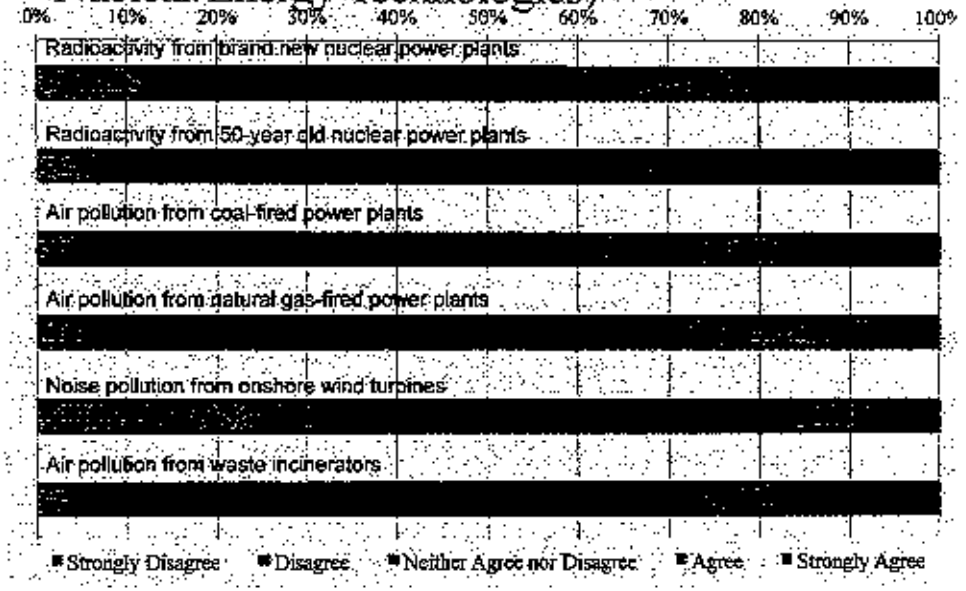
Dimension of Gov't Trustworthiness (Mean Value) – cont'd



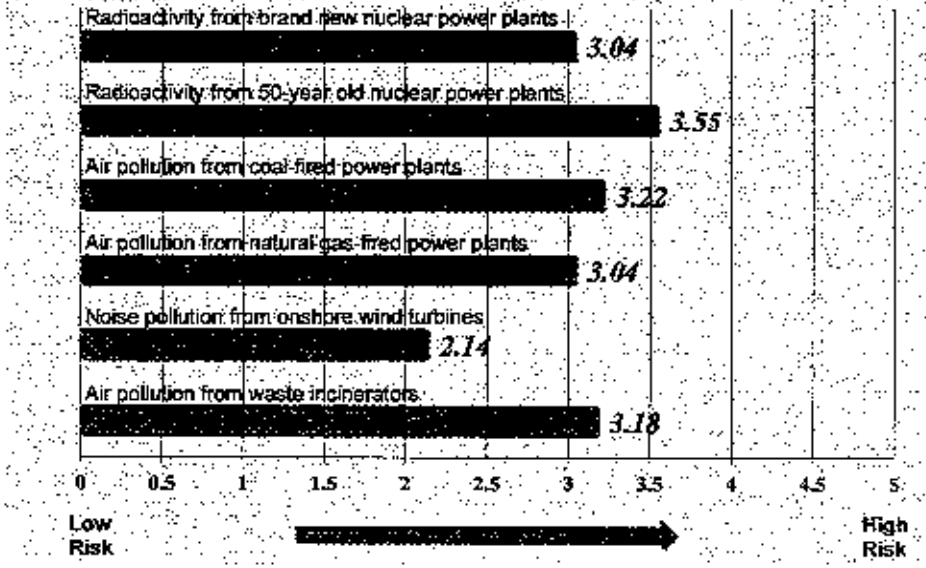
Overall Risk Perception of Radioactivity from Old NPPs



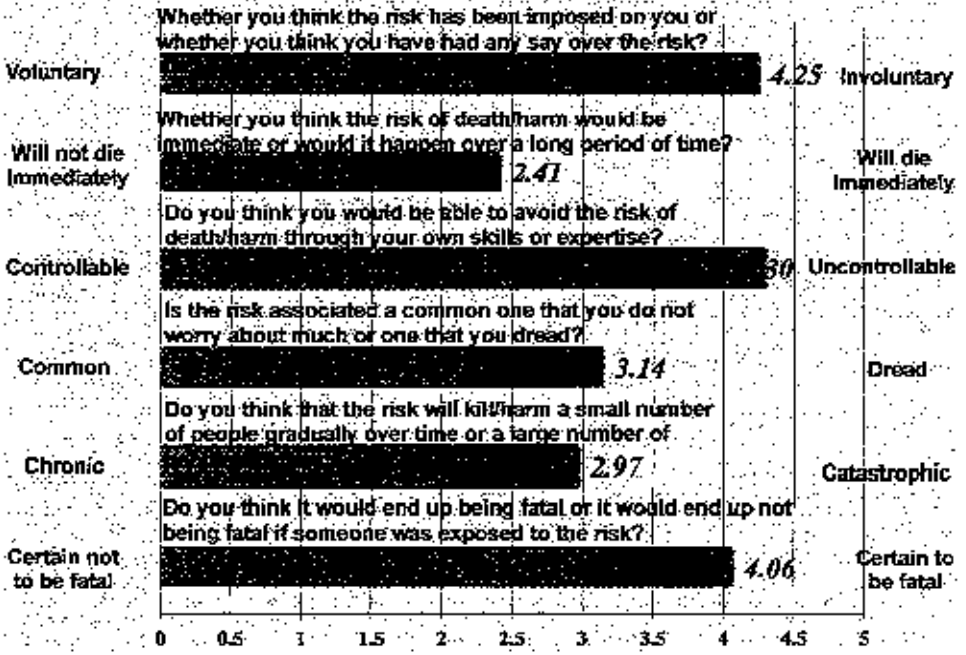
Overall Risk Perception (Different Types of Nuclear/Energy Technologies)



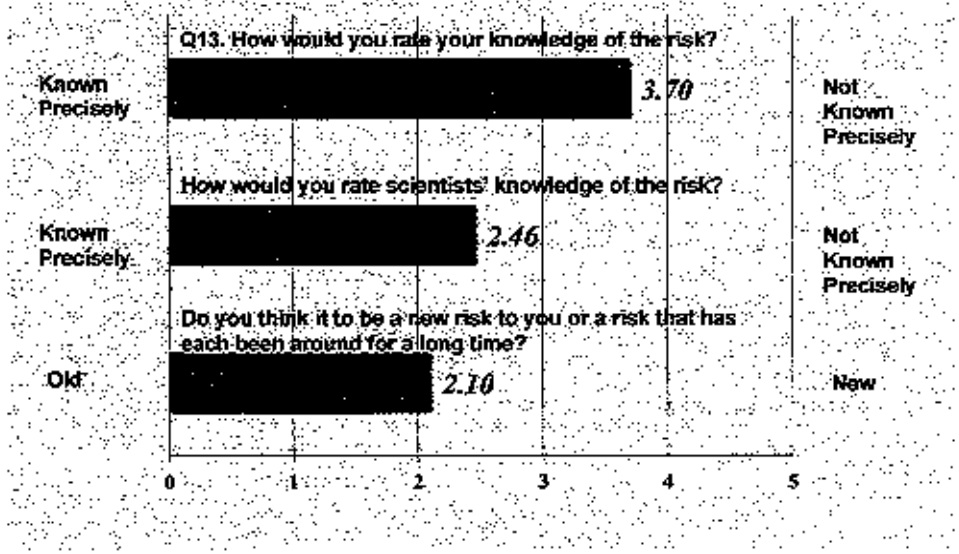
Overall Risk Perception (Mean Value of Different Types of Nuclear/Energy Technologies)



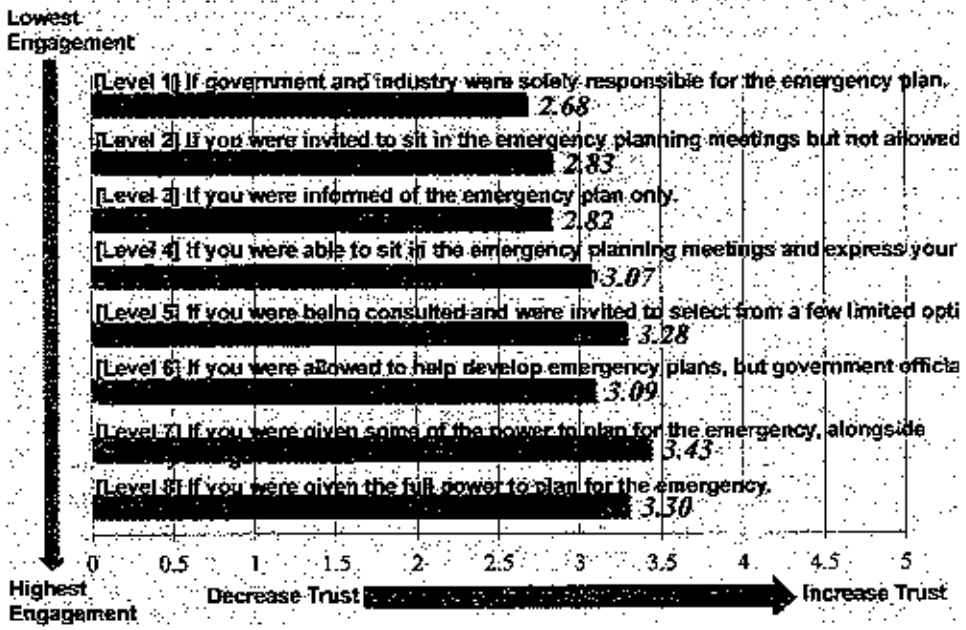
Risk Perception of Old NPPs (Threat Questions)



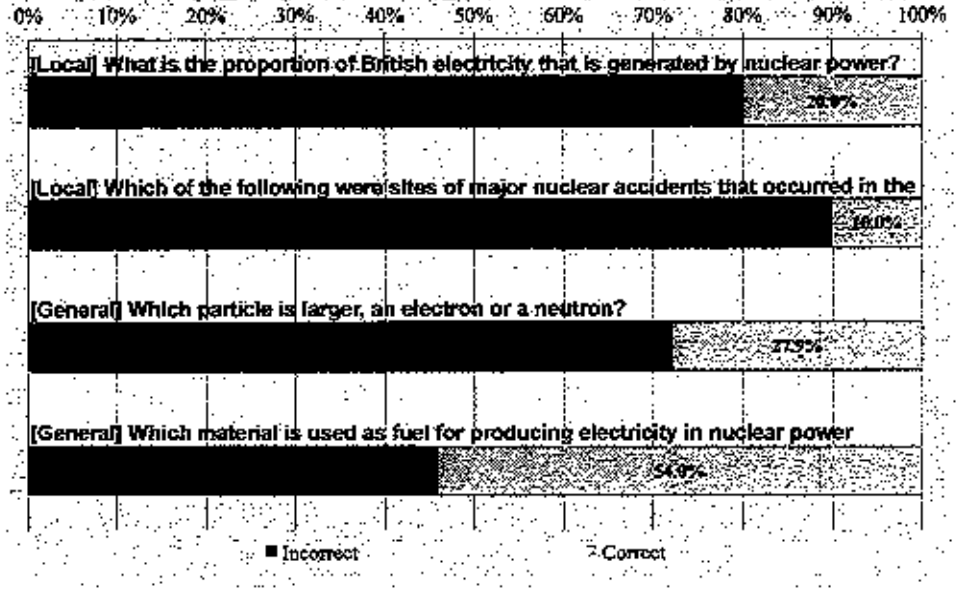
Risk Perception of Radioactivity Released from Old NPPs (Uncertainty Questions)



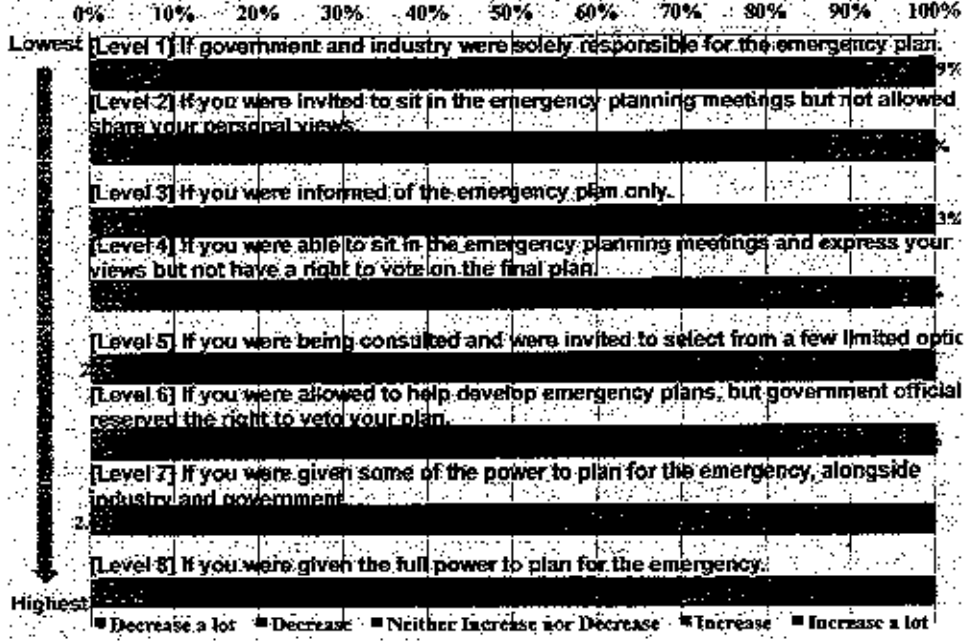
Level of Engagement (Mean Score)



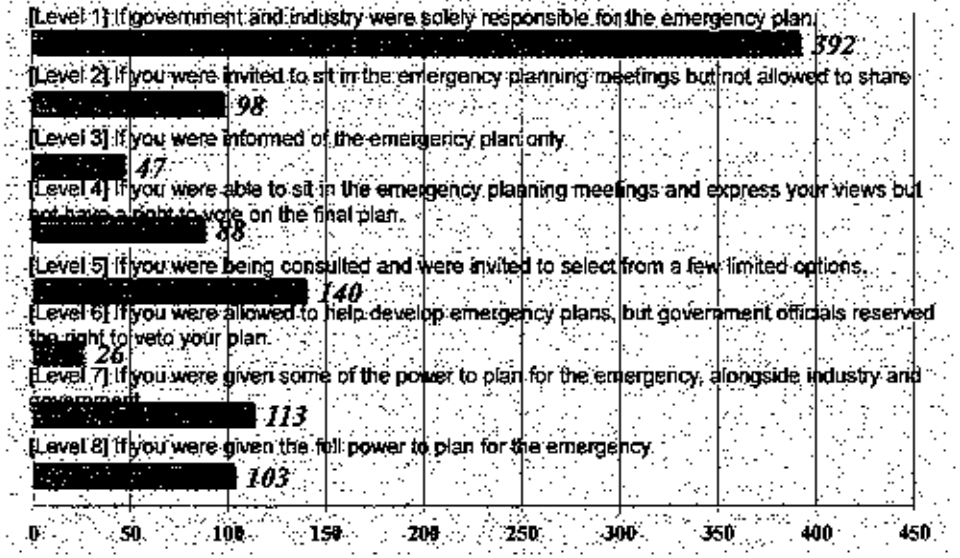
Knowledge (Percentage of Correct Answers)



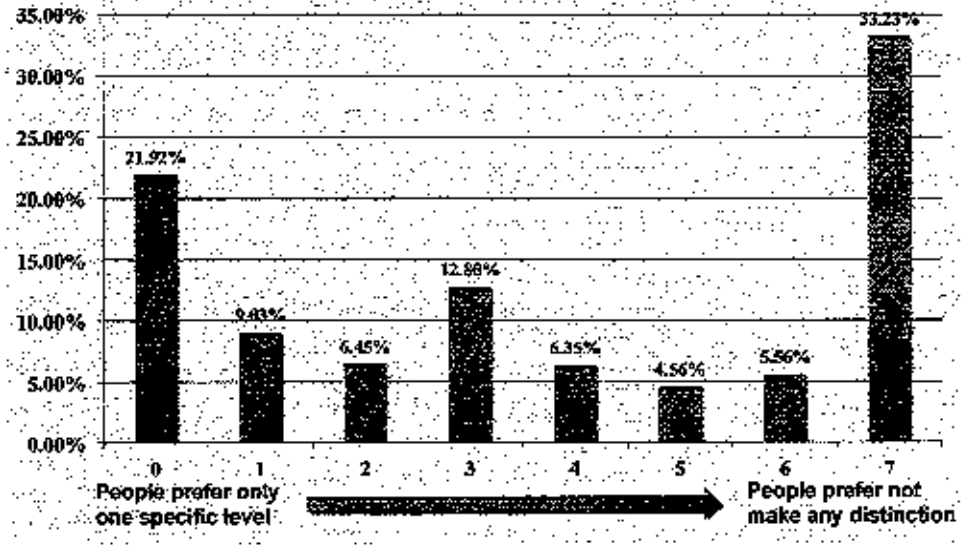
Level of Engagement (Trust in the Gov't)



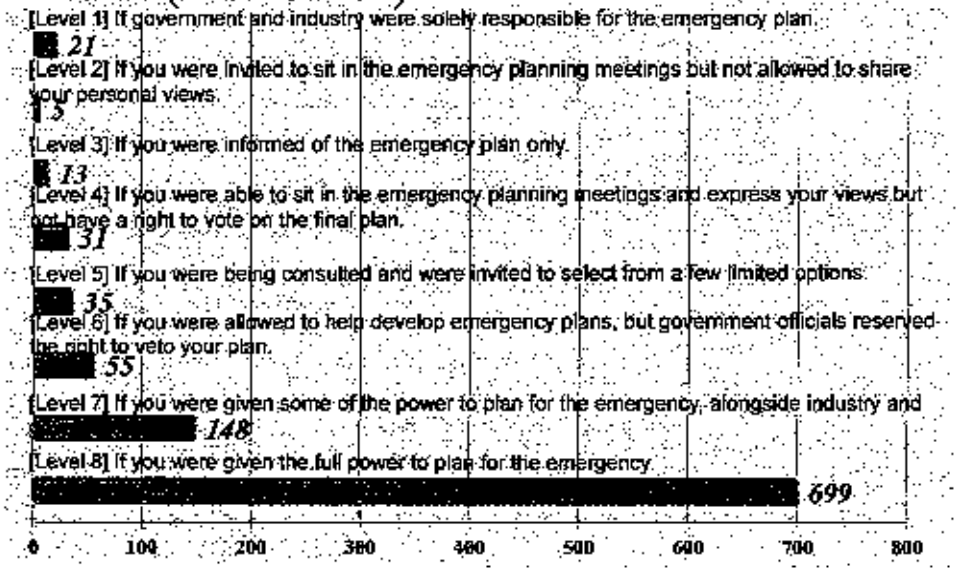
Min Level of Engagement with Max Trust Value (Distribution)



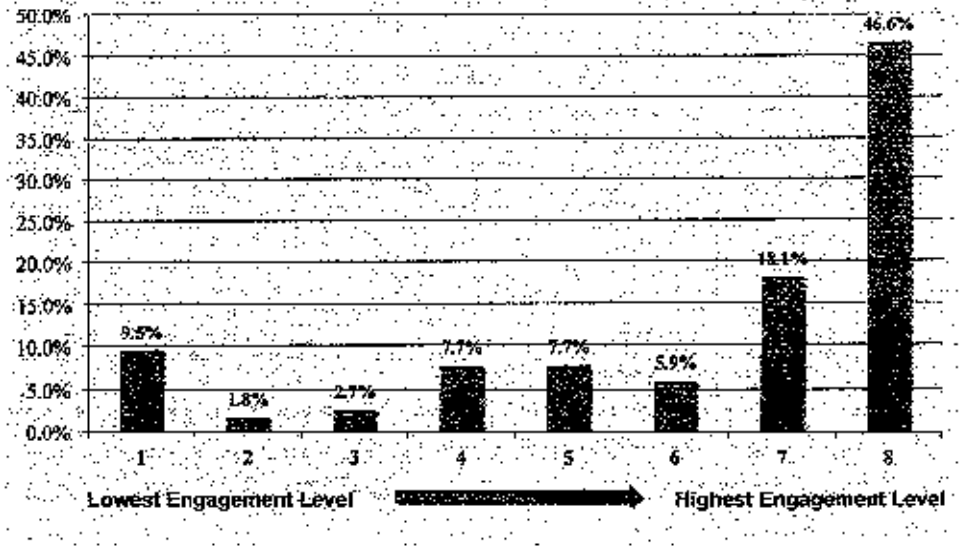
Difference between the Highest & the Lowest Level of Engagement with Max Trust Value



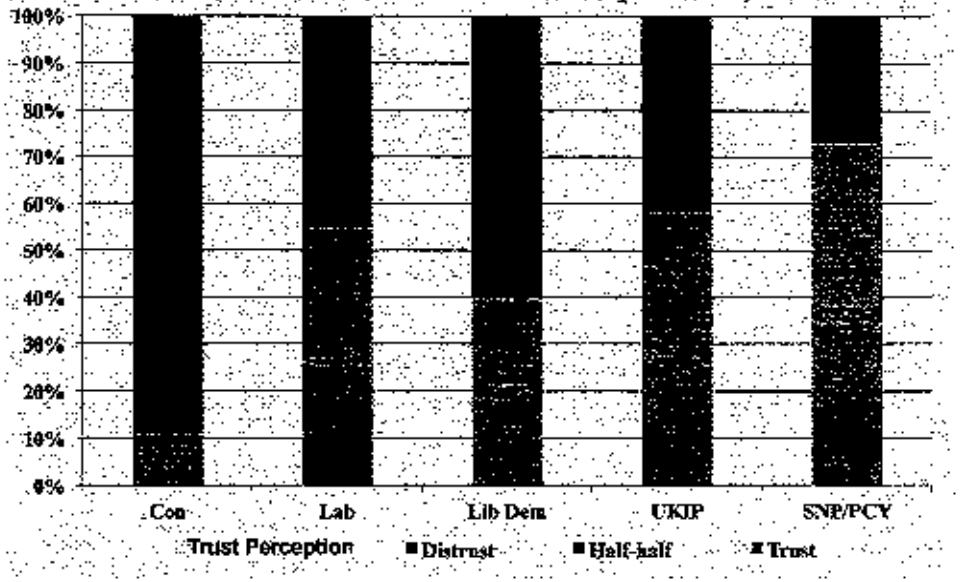
Max Level of Engagement with Max Trust Value (Distribution)



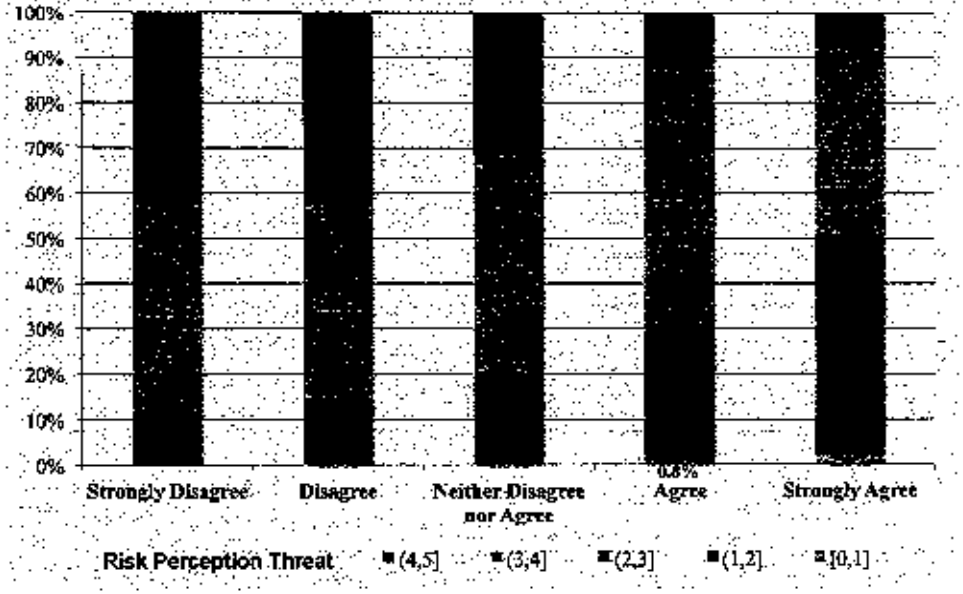
Level of Engagement with Max Trust Value of People Who Prefer Only One Option



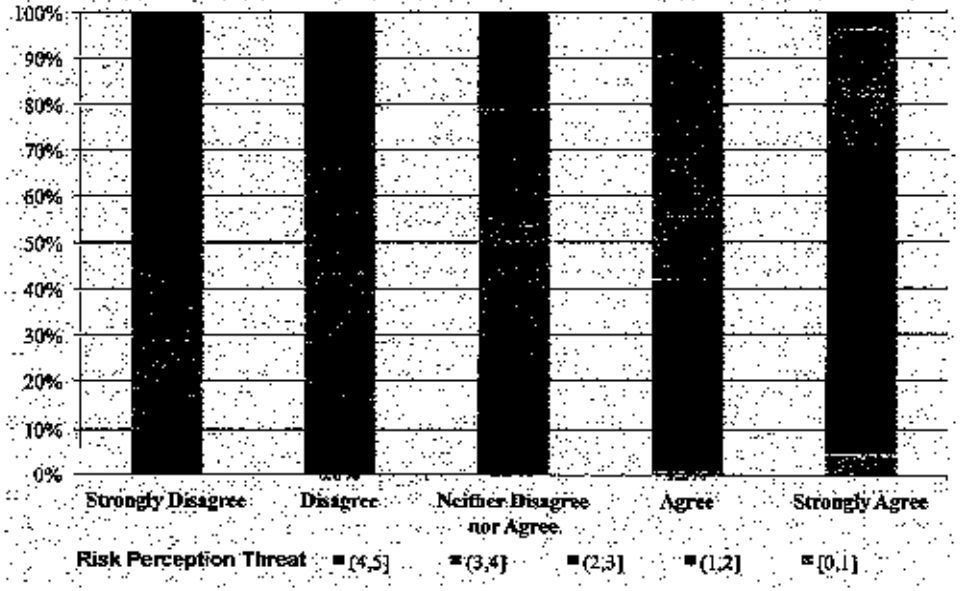
Overall Trustworthiness & Vote Intention
(ANOVA: R2=23.6%, p<.001)



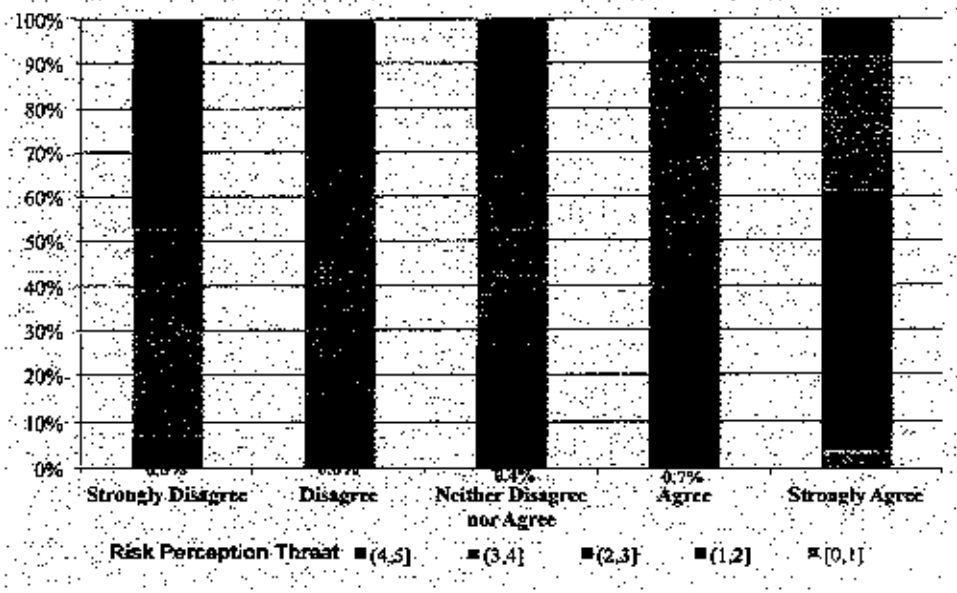
Risk Perception re Nuclear as Threat
(ANOVA, R2=13.5%, p<0.001)



Risk Perception re Nuclear as Safe
(ANOVA R2=19.0%, p<0.001)



Risk Perception re Nuclear as Secure
(ANOVA, R2=16.5%, p<0.001)



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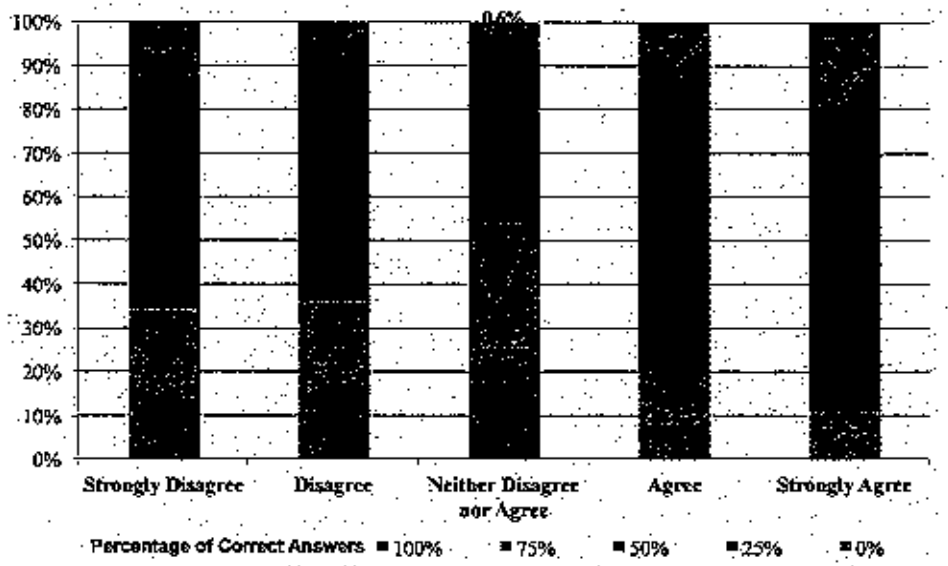
(R2=14.9%, p<0.001)



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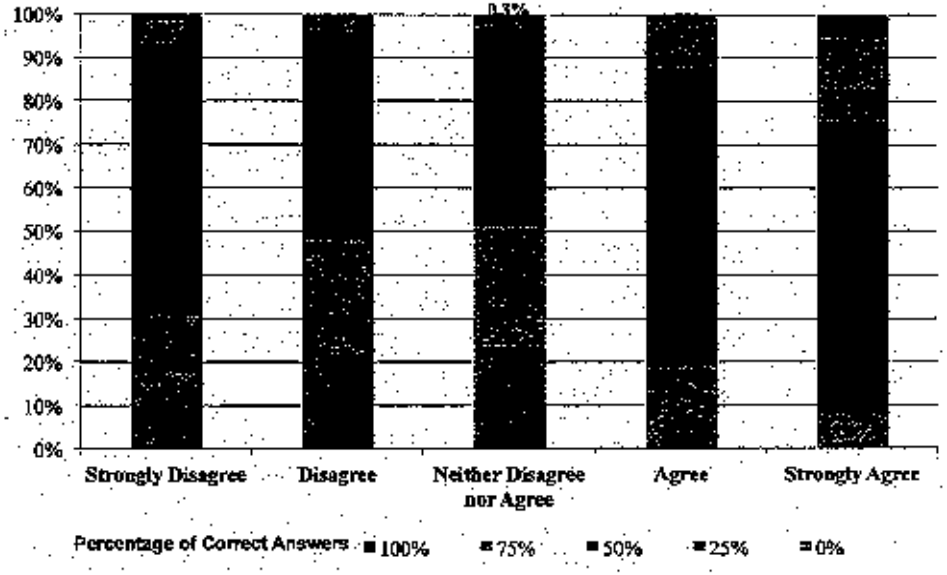
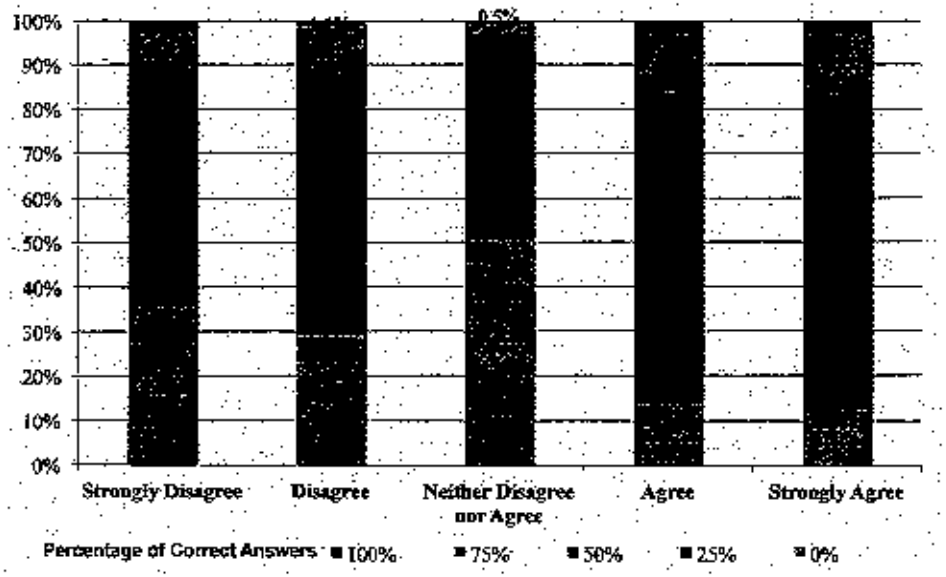
(R2=18.6%, p<0.001)



[redacted]

p<0.001)



4. Statistical Analysis

(More to be inserted)

Q1. What Dimensions Predicts Overall Gov't Trustworthiness?

Logistic Regression of Trust Dimensions that Affect Overall Trustworthiness of Government in NSEG

Variable	High Trustworthiness	Half-half
[illegible]	[illegible]	[illegible]
McFadden pseudo-R^2	39.7%	
[illegible]	[illegible]	[illegible]
Openness	0.365*	0.453***
[illegible]	[illegible]	[illegible]
Integrity	1.221***	0.897***
[illegible]	[illegible]	[illegible]
Fairness	0.414**	0.315**
[illegible]	[illegible]	[illegible]
Competence	1.822***	0.792***

- The reference category is Low Overall Trustworthiness
- * indicates *p*-value < 0.1, ** indicates *p*-value < 0.05, and *** indicates *p*-value < 0.01

Q2. What predicts overall perception of risk/harm from radioactivity released from old NPPs?

Logistic Regression of Risk Dimensions that Affect Overall Risk Perception of Radioactivity from Old Nuclear Power Plants

Variable	High Risk Perception	Medium Risk Perception
[illegible]	[illegible]	[illegible]
McFadden pseudo-R^2	15.3%	
[illegible]	[illegible]	[illegible]
Threat of Old NPPs	2.267***	0.801***
[illegible]	[illegible]	[illegible]

- The reference category is Low Risk Perception
- * indicates *p*-value < 0.1, ** indicates *p*-value < 0.05, and *** indicates *p*-value < 0.01

[illegible] from radioactivity released from old NPPs?

Logistic Regressions of Risk Dimensions that Affect Overall Risk Perception of Radioactivity from Old Nuclear Power Plants

Variable	High Risk Perception	Medium Risk Perception
[illegible]	[illegible]	[illegible]
McFadden pseudo-R^2	21.7%	
[illegible]	[illegible]	[illegible]
Voluntary-Involuntary	0.403***	-0.091
[illegible]	[illegible]	[illegible]
Controllable-Uncontrollable	0.051	-0.144
[illegible]	[illegible]	[illegible]
Common Dread	0.776***	0.226*
[illegible]	[illegible]	[illegible]
Unknown-Known (about Risk)	0.079	0.095
[illegible]	[illegible]	[illegible]
New-Old	0.106	0.323**

- The reference category is Low Risk Perception

[illegible] gov't trustworthiness in NSEG?

Logistic Regression of Trustworthiness in NSCG Predicted by Risk Perception (Threat), Engagement, Knowledge, and Demographics

Variable	High Gov't Trustworthiness	Half-half
[illegible]	[illegible]	[illegible]
McFadden pseudo-R^2	14.6%	
[illegible]	[illegible]	[illegible]
Risk Perception (Threat)	-0.420***	-0.183
[illegible]	[illegible]	[illegible]
Min Engagement Level that achieves Max Trust Value	-0.260***	-0.173***
[illegible]	[illegible]	[illegible]
Vote Intention = Con	2.675***	1.234***

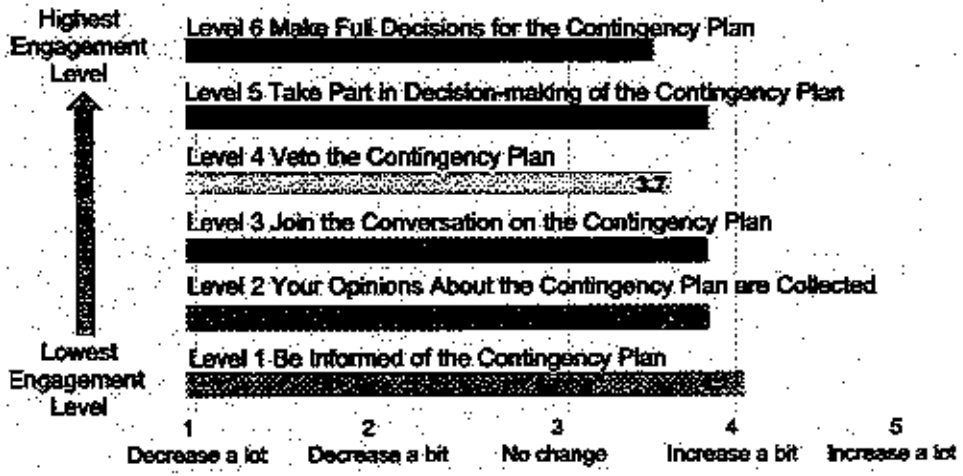
- The reference category is Low Overall Trustworthiness
- * indicates *p*-value < 0.1, ** indicates *p*-value < 0.05, and *** indicates *p*-value < 0.01

Q4. What determines gov't trustworthiness in NSEG?

Variable	High Overall Trustworthiness	Half-half
[illegible]	[illegible]	[illegible]
Vote = Lib Dem	0.290	-1.105
[illegible]	[illegible]	[illegible]
Vote = SNP / PCY	-0.064	-0.917*
[illegible]	[illegible]	[illegible]

- The reference category is Low Overall Trustworthiness
- * indicates *p*-value < 0.1, ** indicates *p*-value < 0.05, and *** indicates *p*-value < 0.01

Engagement Level & Trust in the Contingency Plan (Mean) Score obtained in Hong Kong



Q3. Which Engagement Level Can Increase Trust?

- ANOVA test shows that group mean value differences are statistically significant (F=93.931; p<0.0001)!
- Post-hoc test shows the greatest mean difference is obtained between L7 (The UK public are making decisions alongside with gov't and industry) and L1 (The UK public are not being engaged at all) (Mean Difference = 0.752; p<0.0001)!
- UK public are making decisions alongside with the gov't in NSEG can generate the highest trust (L7, Mean = 3.43), followed by,
- UK public are giving the full power to plan for emergency generate the second highest trust (L8, Mean = 3.30)
- UK people are being consulted and are invited to select from a few NS planning options (L5, Mean= 3.28)
- UK People are informed of the emergency plan only (L2, Mean = 2.82)
- The Government making the full decisions for NSEG gives the lowest trust (L1, Mean = 2.68)

Q3. Which Engagement Level Can Increase Trust?

1. UK public would trust more in the gov't if they can plan alongside gov't and industry (Mean value = 3.43), rather than be given the full power for emergency planning (Mean value = 3:30), but they certainly would not trust government if they are simply getting informed of emergency planning (Mean value = 2.82)

2. Unlike the case of HK, where the public prefer being passively informed (Mean = 4.1) rather than taking part in some form of decision making (Mean value = 3.9) , the UK public trusts gov't more if it takes a more pro-active role in NSEP.

5. Conclusion

Conclusion (1)

1. Concerning the UK government's overall trustworthiness in NSEG, competence is the most powerful predictor of overall high trustworthiness, followed by other six dimensions of trustworthiness.
2. Overall high perception of risk/harm caused by radioactivity released from old NPPs can be predicted only by the threat dimension but NOT the uncertainty dimension.
3. The five dimensions of risk that predict overall high perception of risk/harm caused by radioactivity released from old NPPs include: Voluntary-Involuntary, Delayed–Immediate, Chronic-Catastrophic, Common-Dread, and Certain Not to be Fatal-Certain to be Fatal. The last risk dimension is the strongest predictor of overall risk perception under the high risk category.

Conclusion (2)

1. The UK public trust most in the government's NSEG when they are being engaged in nuclear safety decision-making, alongside with the government and industries. Although they also prefer making full decisions by themselves alone, it is NOT the most preferred option.
2. For the UK public, getting informed of emergency planning is also not a preferred option for giving more trust to the UK government.
3. Unlike HK public who prefer being passively informed of NSEP, UK public would trust more in the government if they be allowed to take up a more active role in NSEP.
4. The government may win the trust of UK citizens in NSEG by giving them more opportunities to participate in its nuclear safety decision-making; and reduce fears that associate with radioactivity released from old NPPs.

Conclusion (3)

High trustworthiness of the government is related to the following variables:

- Overall knowledge about nuclear power and safety (strongest predictor)
- The public's risk perception associated with the threat dimensions (-ve relationship)
- The maximum change in trust at a given level of engagement
- The minimum level of engagement that is needed to gain the maximum change in trust. (-ve relationship)
- Political party preference for Conservatives.

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THANK YOU!

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