

# Public Understanding for CO<sub>2</sub> Sequestration

## *A multinational Comparison*

*International Workshop on CO<sub>2</sub> Geological Storage,  
JAPAN '06*

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# Acknowledgment

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# Background

- Project on CCS Social and Political Implications
  - Identify, study, and address non-technical issues associated with CCS
  - Provide guidance to decision makers
  - Evaluate attitudes of the public and key stakeholders to see what role CCS might play in a more sustainable energy system
- Public Attitude Reference
  - Reiner, D.M., T.E. Curry, M.A. de Figueiredo, H.J. Herzog, S.D. Ansolabehere, K. Itaoka, F. Johnsson, M. Odenberger, "American Exceptionalism? Similarities and Differences in National Attitudes Towards Energy Policy and Global Warming," accepted by *Environmental Science & Technology* (2006).

# Survey of Public Attitudes

	<b>US</b>	<b>UK</b>	<b>Sweden</b>	<b>Japan</b>
<b>Survey distribution</b>	Knowledge Networks	YouGov	Statistics Sweden	Mizuho Inst. & NAIST
<b>Research partner</b>	MIT	Cambridge	Chalmers	Mizuho Inst.
<b>Methodology</b>	Internet	Internet	Written	Written
<b># of responses</b>	1,205	1,056	742	1,006
<b>Response rate</b>	70%	40%	49%	64%
<b>Date of survey</b>	Oct 2003	Sept 2004	Dec 2004	Dec 2003
<b>Questions</b>	20 multiple choice	20 multiple choice	20 multiple choice	5 written + 66 multiple Choice

# Outline

- Public Attitude toward and Understanding of Climate Change
- Public Awareness of CO<sub>2</sub> Capture and Storage (CCS)
- Implications for Public Acceptance

# What are the Three Most Important Issues Facing the US Today?

Rank	Issue	%
1	Terrorism	42
2	Health Care	35
3	Economy	35
4	Unemployment	30
5	Family Values	20
6	Education	19
7	Federal Budget Deficit	15
8	Foreign Policy	14
9	Crime	14
10	Social Security	13
11	Drugs	12

Rank	Issue	%
12	Taxes	11
13	Environment	9
14	Poverty	8
15	Aging Population	5
16	Income Inequality	4
17	AIDS	4
18	Abortion	4
19	Racism	4
20	Welfare	3
21	Inflation	3
22	Stock Market	2

# What are the Three Most Important Issues Facing the UK Today?

Rank	Issue	%
1	Asylum seekers	42
2	Terrorism	39
3	Crime	31
4	Health care	26
5	Education	17
6	Drugs	16
7	Aging population	15
8	Environment	13
9	Taxes	13
10	European Union	11
11	Economy	10
12	Family values	10
13	Foreign policy/Influence	10

Rank	Issue	%
14	Introducing €/ Keeping £	7
15	Poverty	7
16	Welfare	6
17	Unemployment	5
18	Income inequality	5
19	Racism	4
20	Social exclusion	4
21	Inflation	2
22	Budget deficit	1
23	AIDS	1
24	Abortion	1
25	Stock market	0
26	None of these	1

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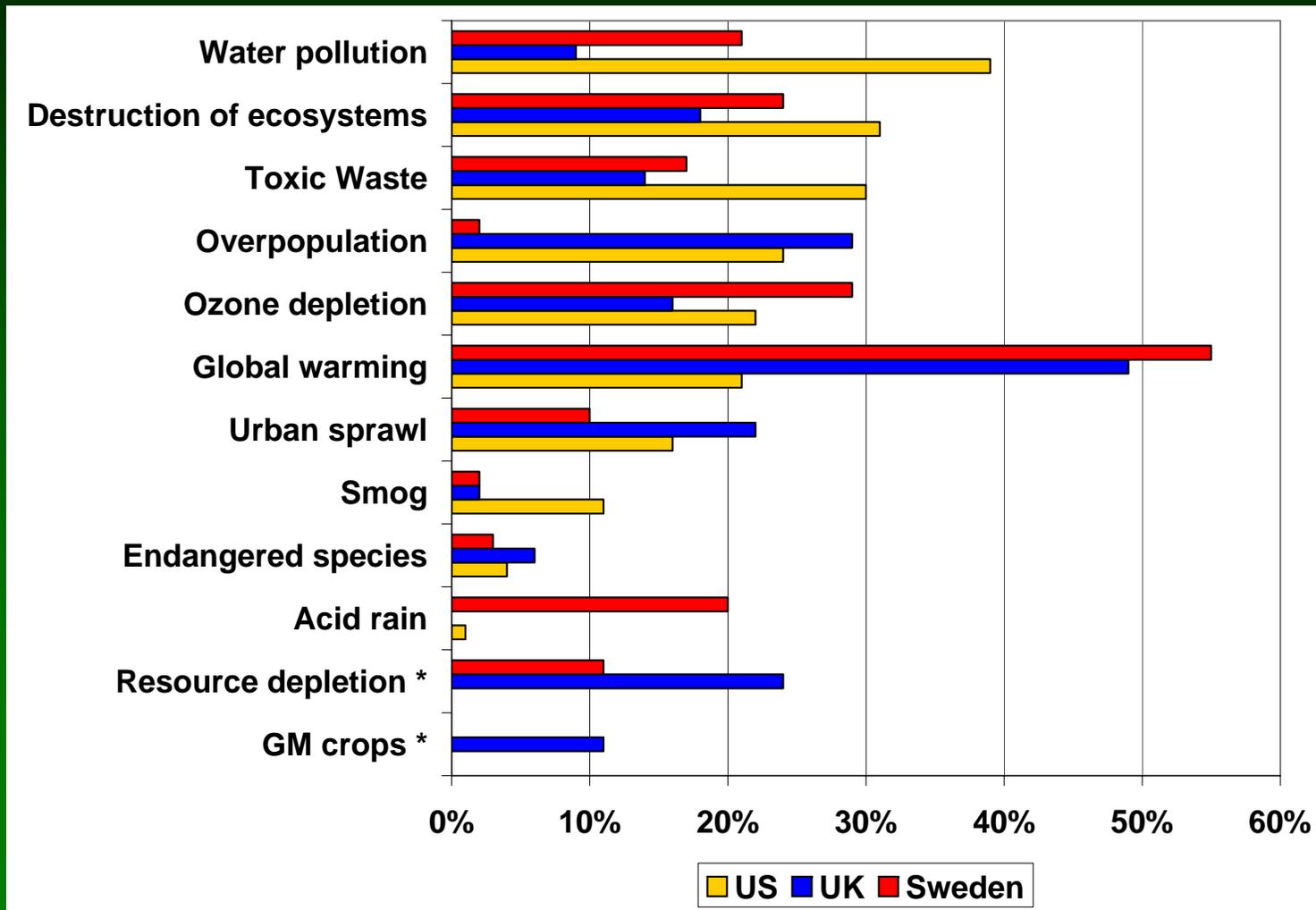
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# What are the Three Most Important Issues Facing Sweden Today?

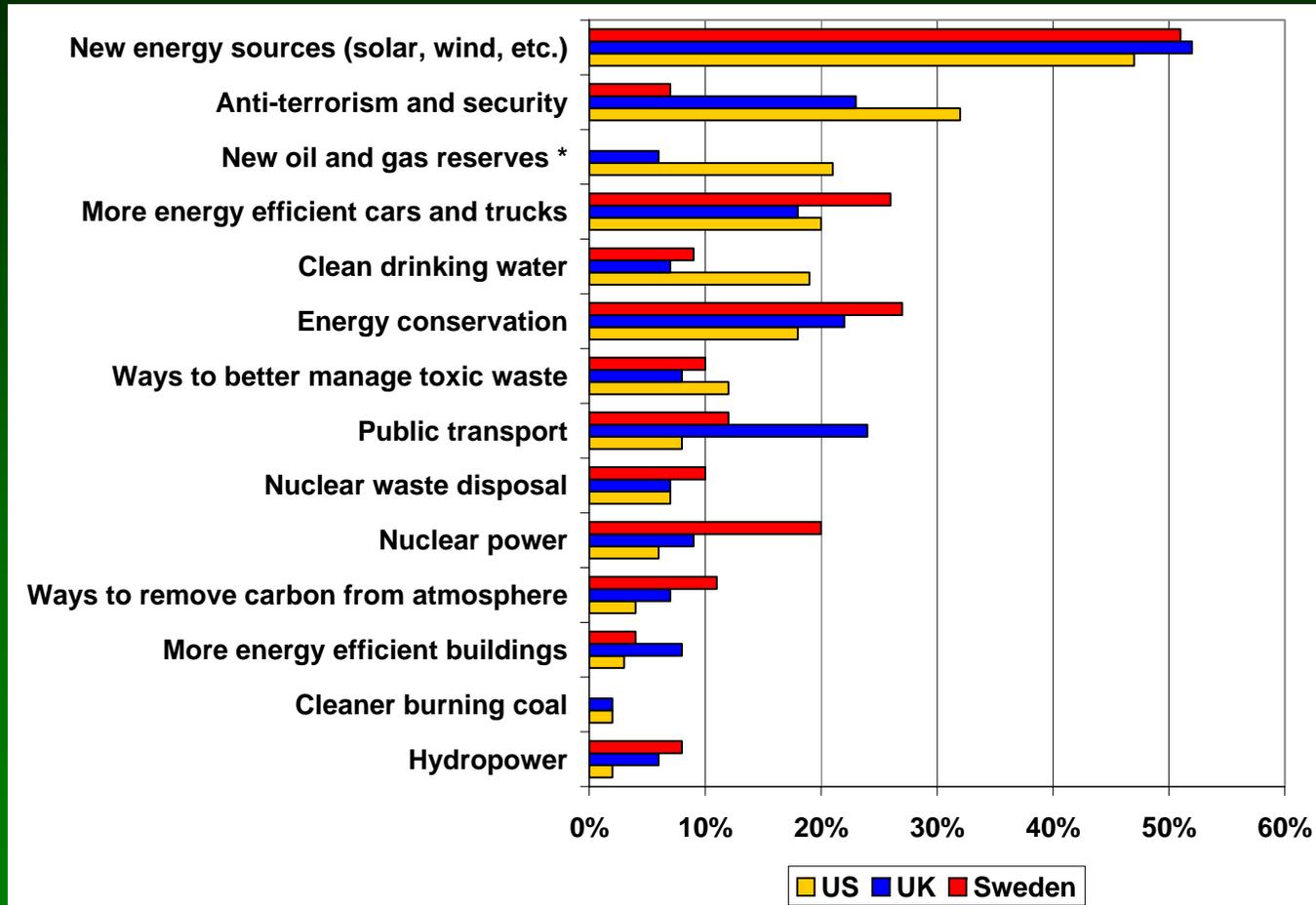
Rank	Issue	%
1	Health care	57
2	Unemployment	44
3	Education	41
4	Crime	28
5	Environment	24
6	Economy of the state	21
7	Income inequity	14
8	Welfare	14
9	Aging population	11
10	Taxes	8

Rank	Issue	%
11	Drugs	7
12	Budget deficit	5
13	Racism	4
14	Poverty	4
15	Foreign policy	2
16	Inflation	2
17	Terrorism	2
18	AIDS	1
19	Stock market	1
	Other	4

# Two Most Important Environmental Problems Facing [My Country] Today



# Top Two Priorities for [My Country's] National Energy Agency (US DOE, etc.)

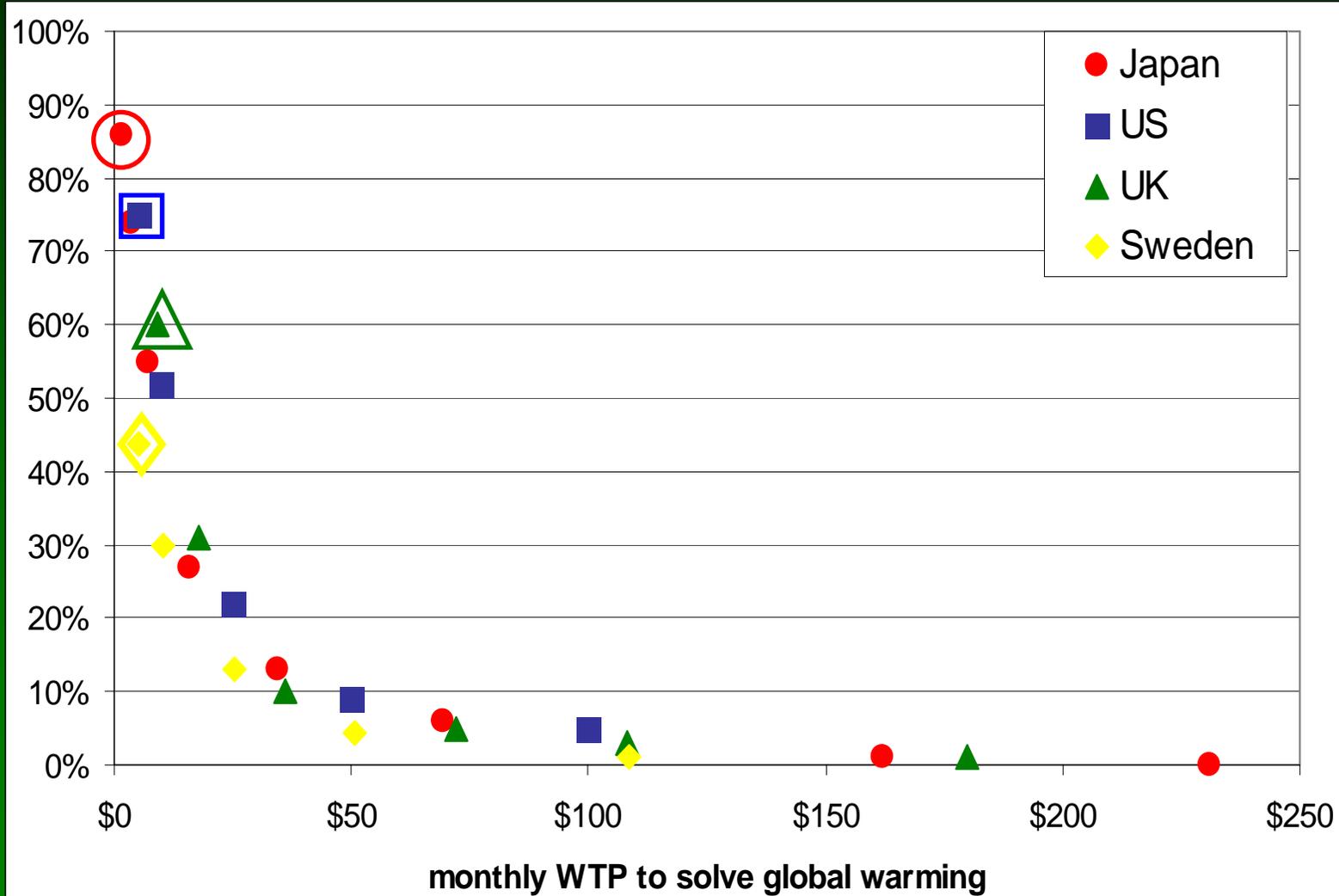


\* New oil and gas reserves not included in Sweden survey

# Economy versus Environment

<b>Answer</b>	<b>US %</b>	<b>UK %</b>	<b>Sweden %</b>
The highest priority should be given to protecting the environment, even if it hurts the economy	9	11	17
Both the environment and the economy are important, but the environment should come first	45	46	54
Both the environment and the economy are important, but the economy should come first	39	30	19
The highest priority should be given to economic considerations such as jobs even if it hurts the environment	8	3	4
Not sure	N/A	11	6

# Willingness to Pay (WTP) to Solve Global Warming



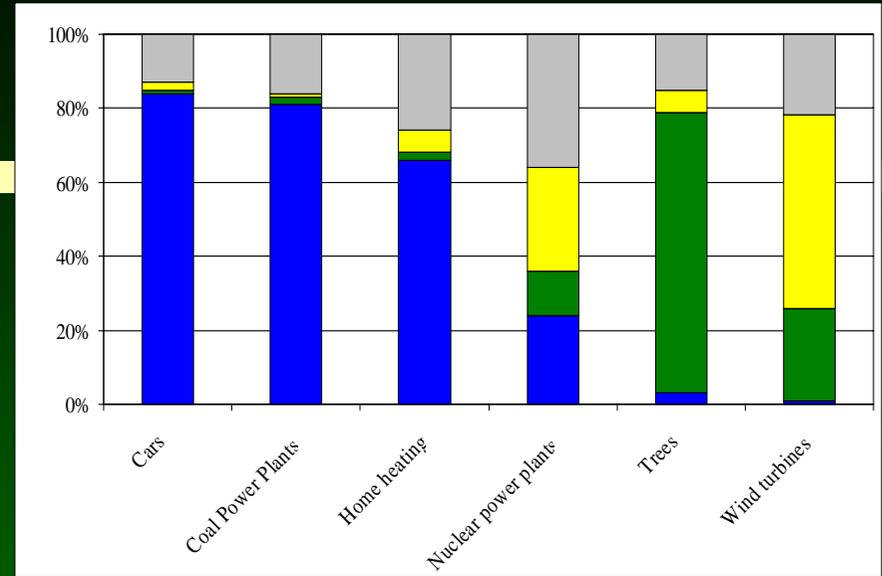
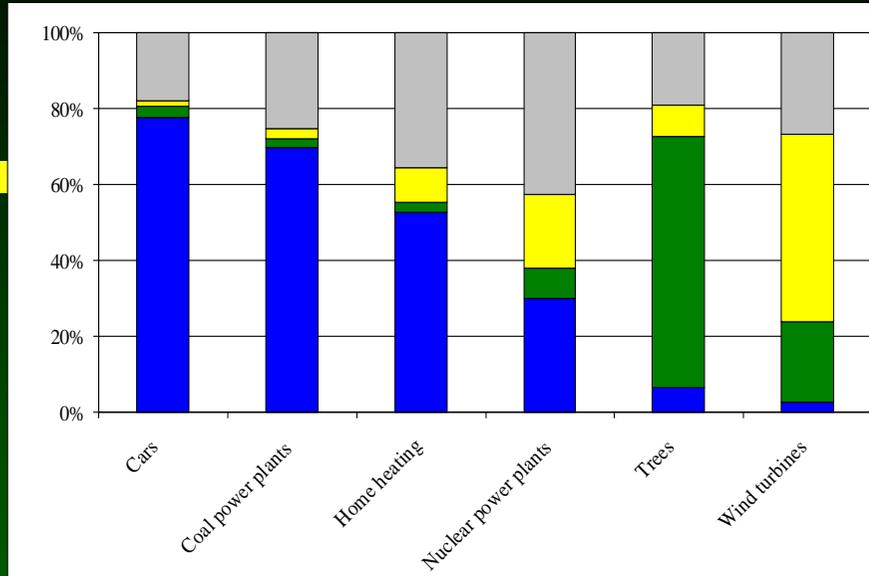
# How Should We Address Global Warming?

Answer	US	UK	Sweden	Japan
Global warming has been established as a serious problem and immediate action is necessary	17	41	35	54
There is enough evidence that global warming is taking place and some action should be taken	36	33	45	34
We don't know enough about global warming and more research is necessary before we take any actions	24	18	13	8
Concern about global warming is unwarranted	7	4	2	0
Not sure	16	4	3	3

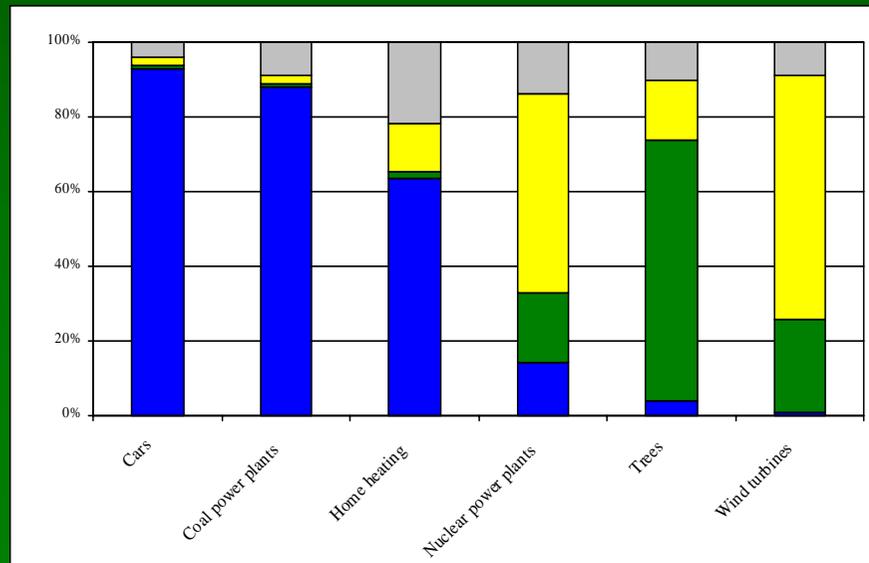
# How Will We Address Global Warming?

Answer	US	UK	Sweden	Japan
I believe that firms and government researchers will develop new technologies to solve the problem	21	26	37	22
I believe we will have to change our lifestyles to reduce energy consumption	32	27	22	66
I believe we will learn to live with and adapt to a warmer climate	17	13	19	4
I believe global warming is a problem but [my country] won't do anything about it	24	21	14	6
I believe we will do nothing since global warming is not a problem	7	3	2	NA
Not sure	NA	10	6	2

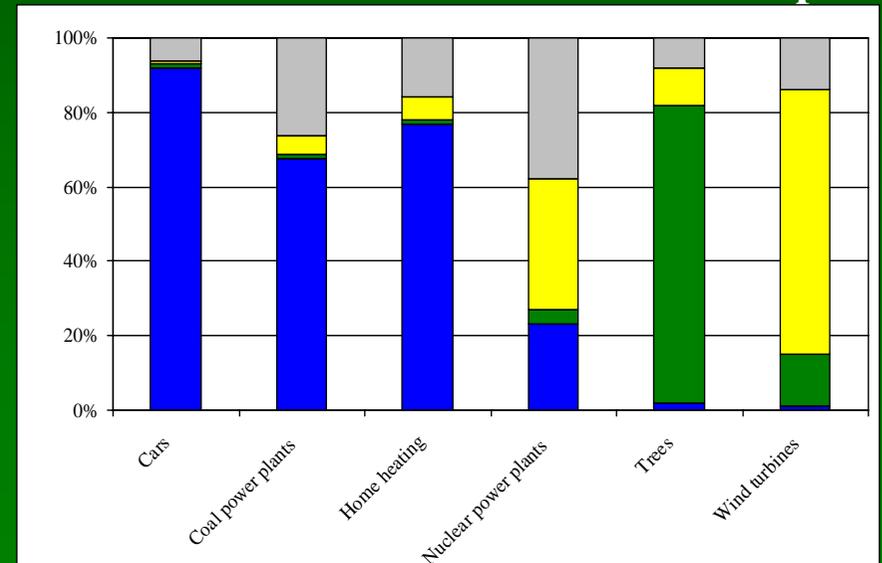
# US How do the Following Contribute to Carbon Dioxide Levels? UK



## Sweden



## Japan



■ Increases   
 ■ Decreases   
 ■ No Effect   
 ■ Not Sure

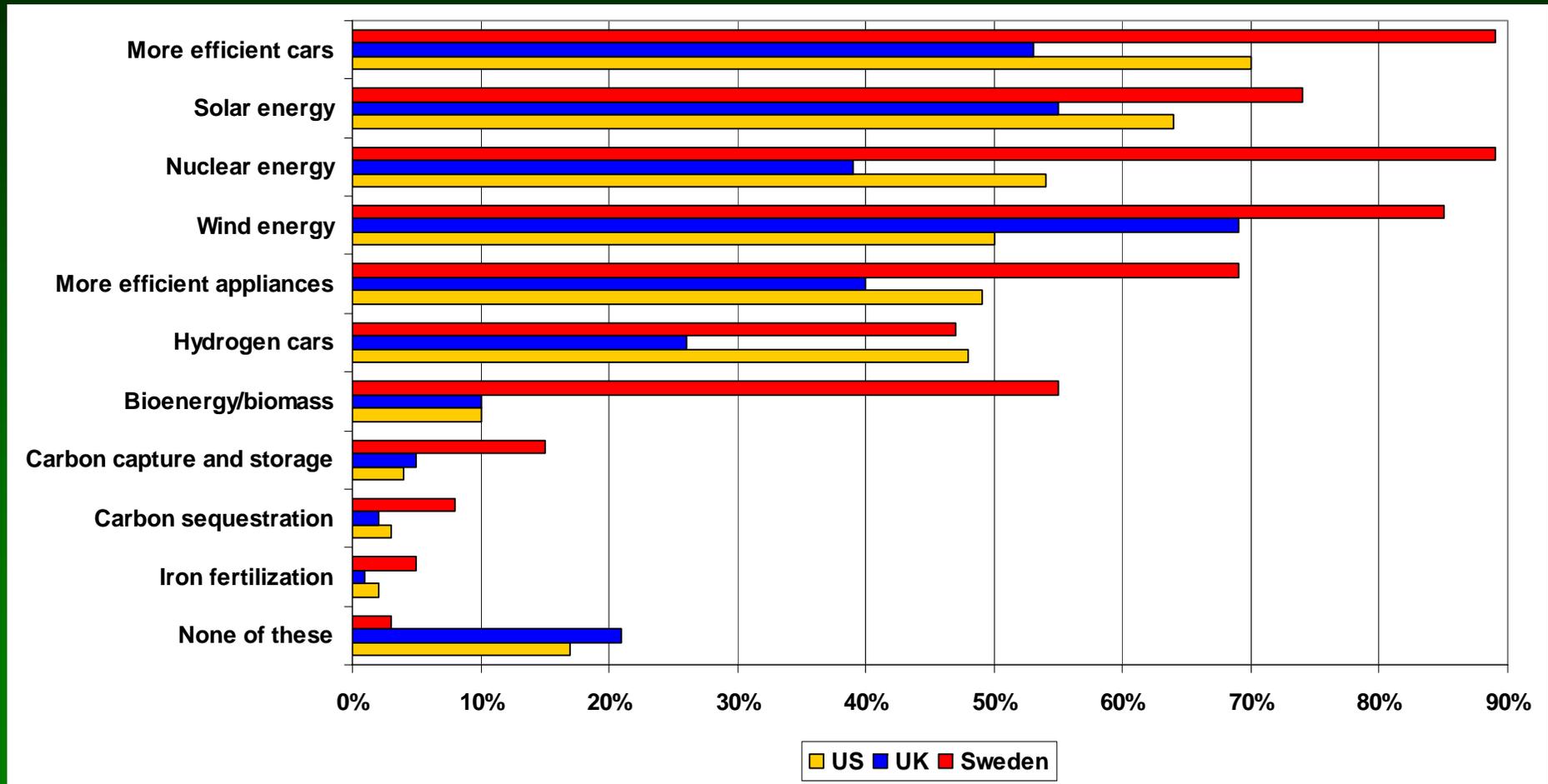
# Summary

- Public opinions & attitudes are largely similar, differences in national policies are associated with different national *priorities*
- Global warming much greater concern in Sweden and UK than US
- US shows weakest support for immediate action, Japan strongest belief in changing lifestyles, and Sweden strongest technology optimists

# Outline

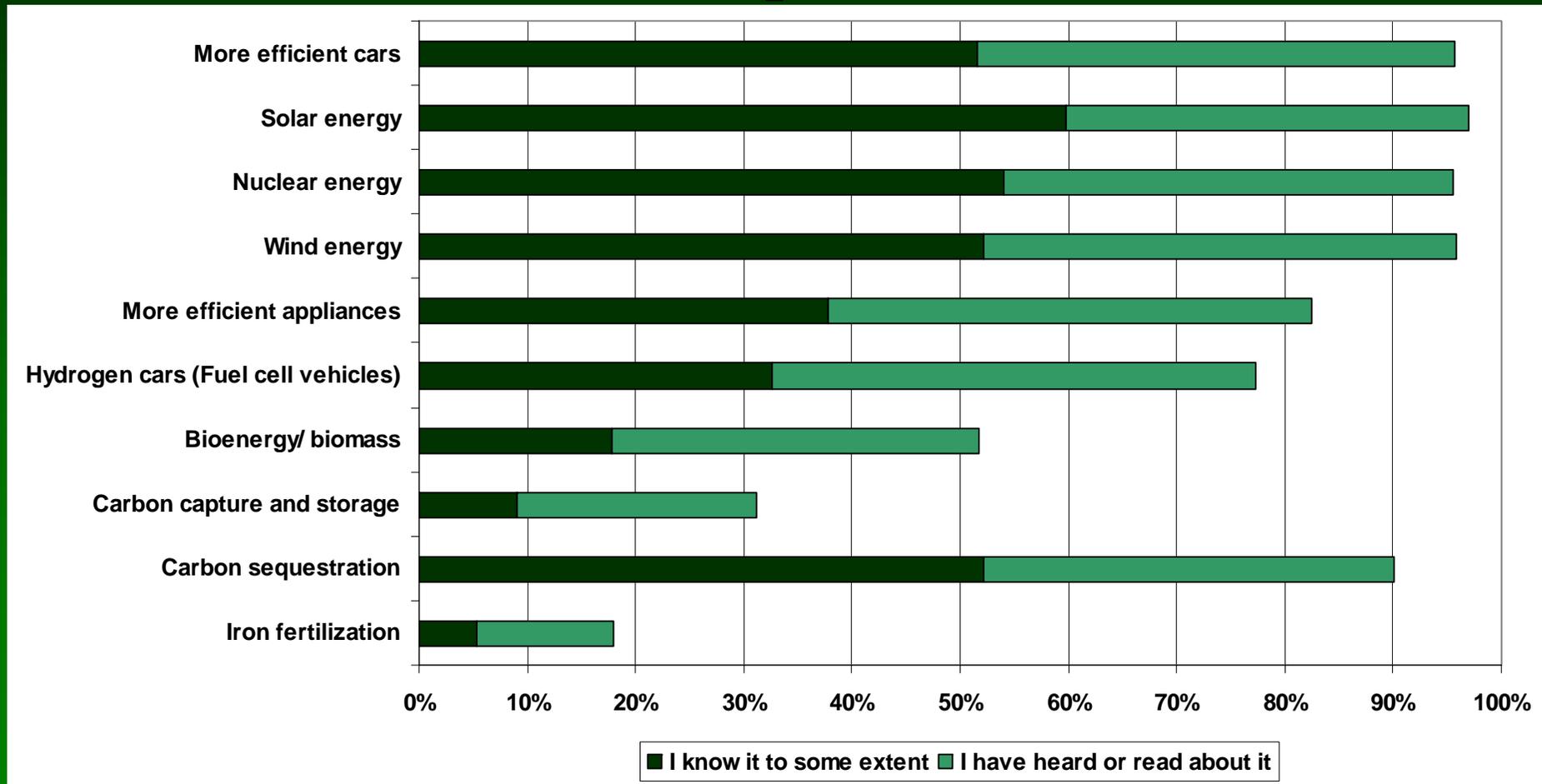
- Public Attitude toward and Understanding of Climate Change
- Public Awareness of CO<sub>2</sub> Capture and Storage (CCS)
- Implications for Public Acceptance

# Have you heard of or read about any of the following in the past year?



# Have you heard of or read about any of the following in the past year?

## Japan



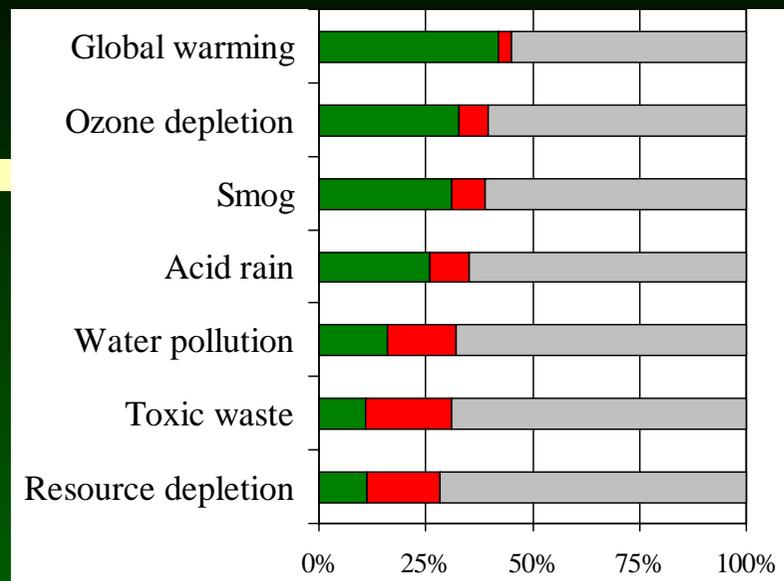
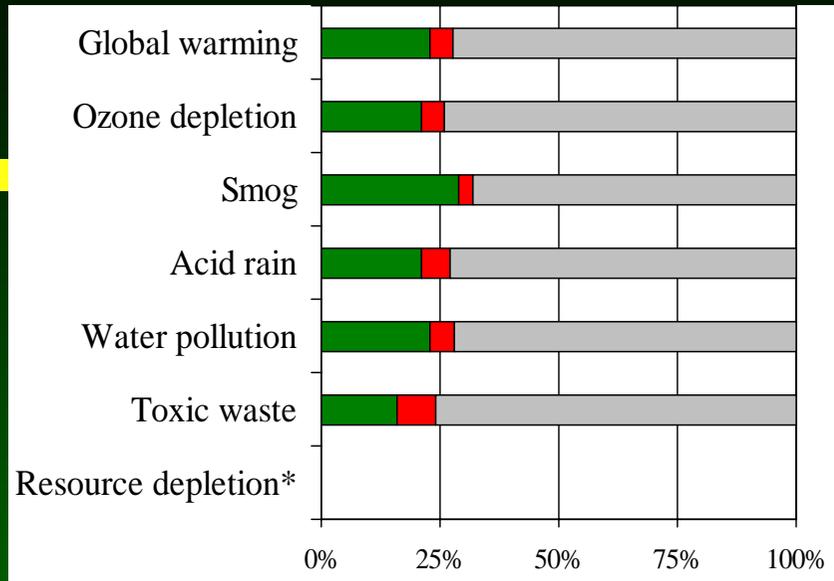
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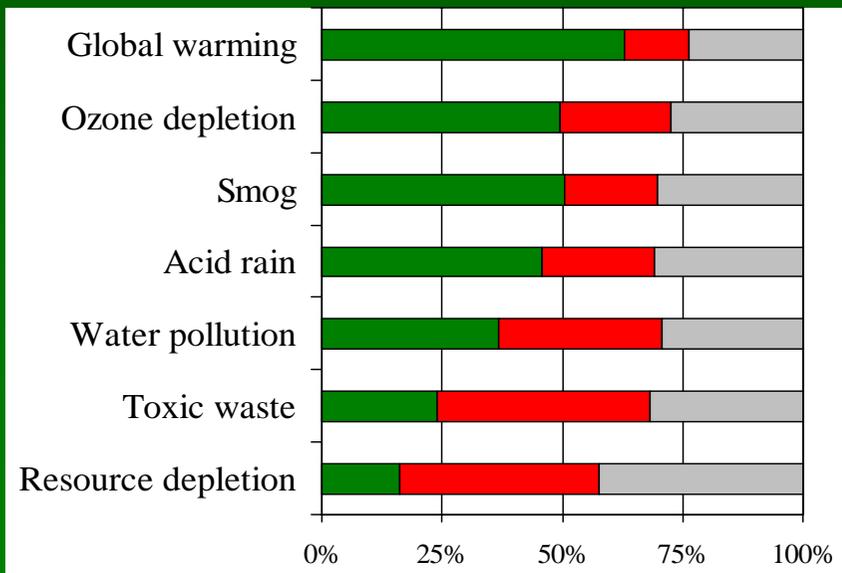
US

# Can CCS Reduce These Environmental Concerns?

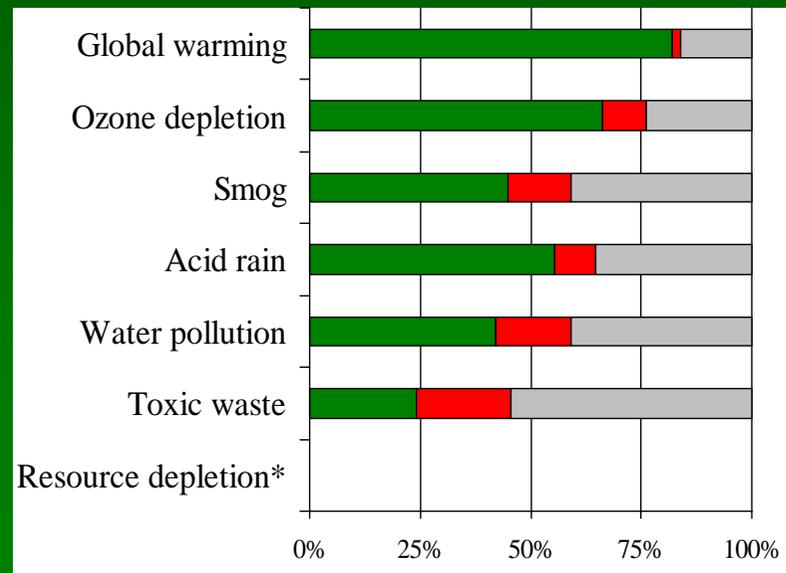
UK



Sweden



Japan

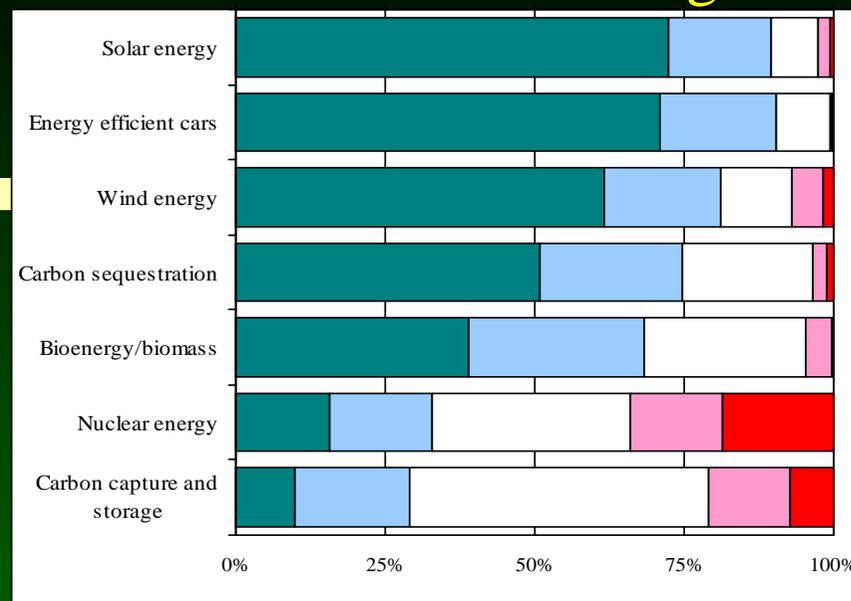
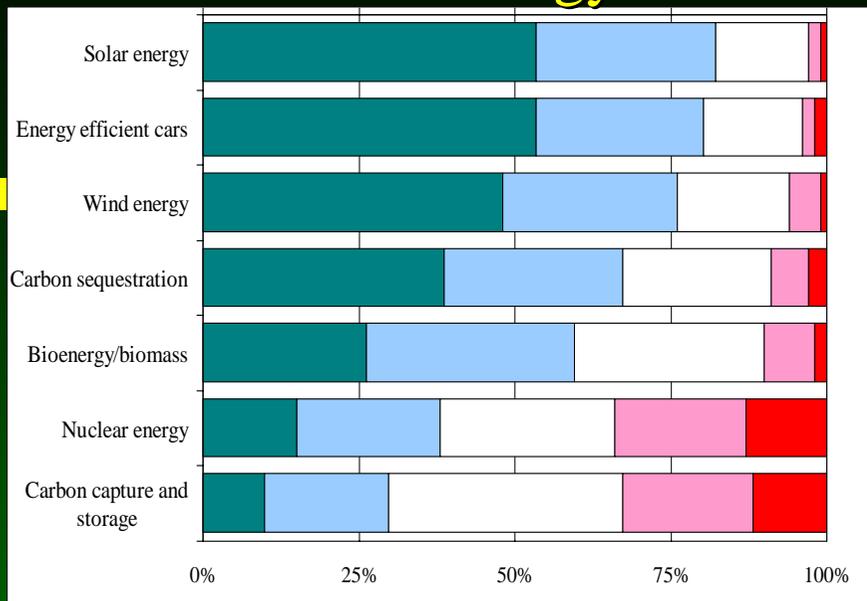


■ Can reduce
 ■ Does not reduce
 ■ Not sure

US

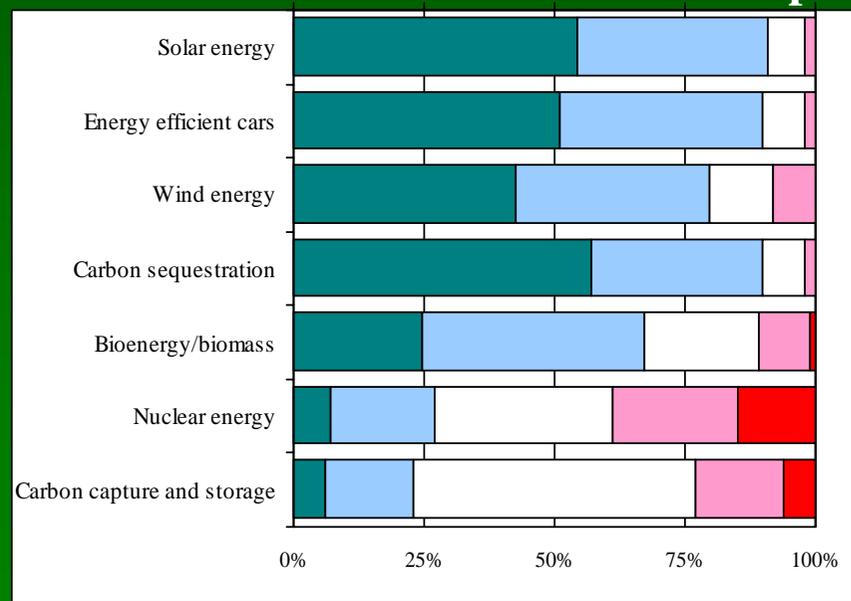
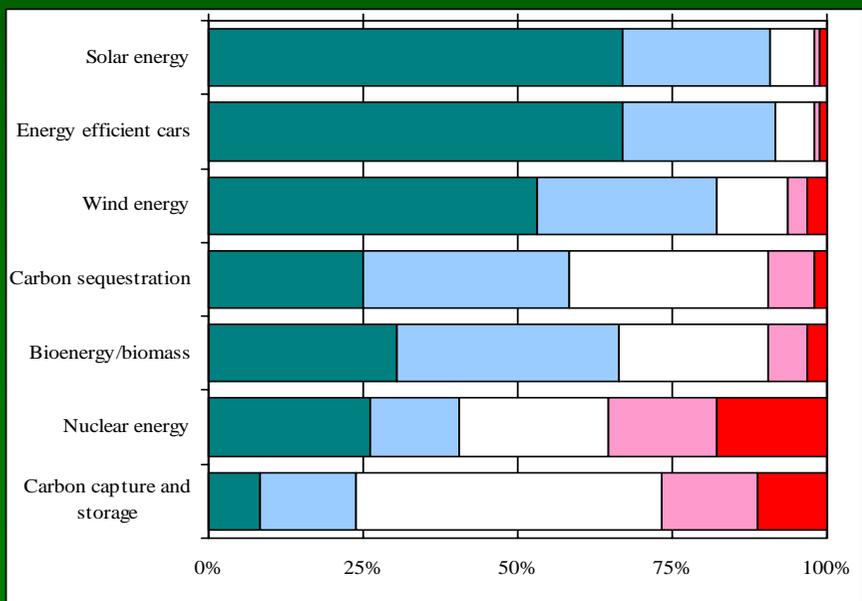
# Preferred Energy Technology to Address Global Warming

UK



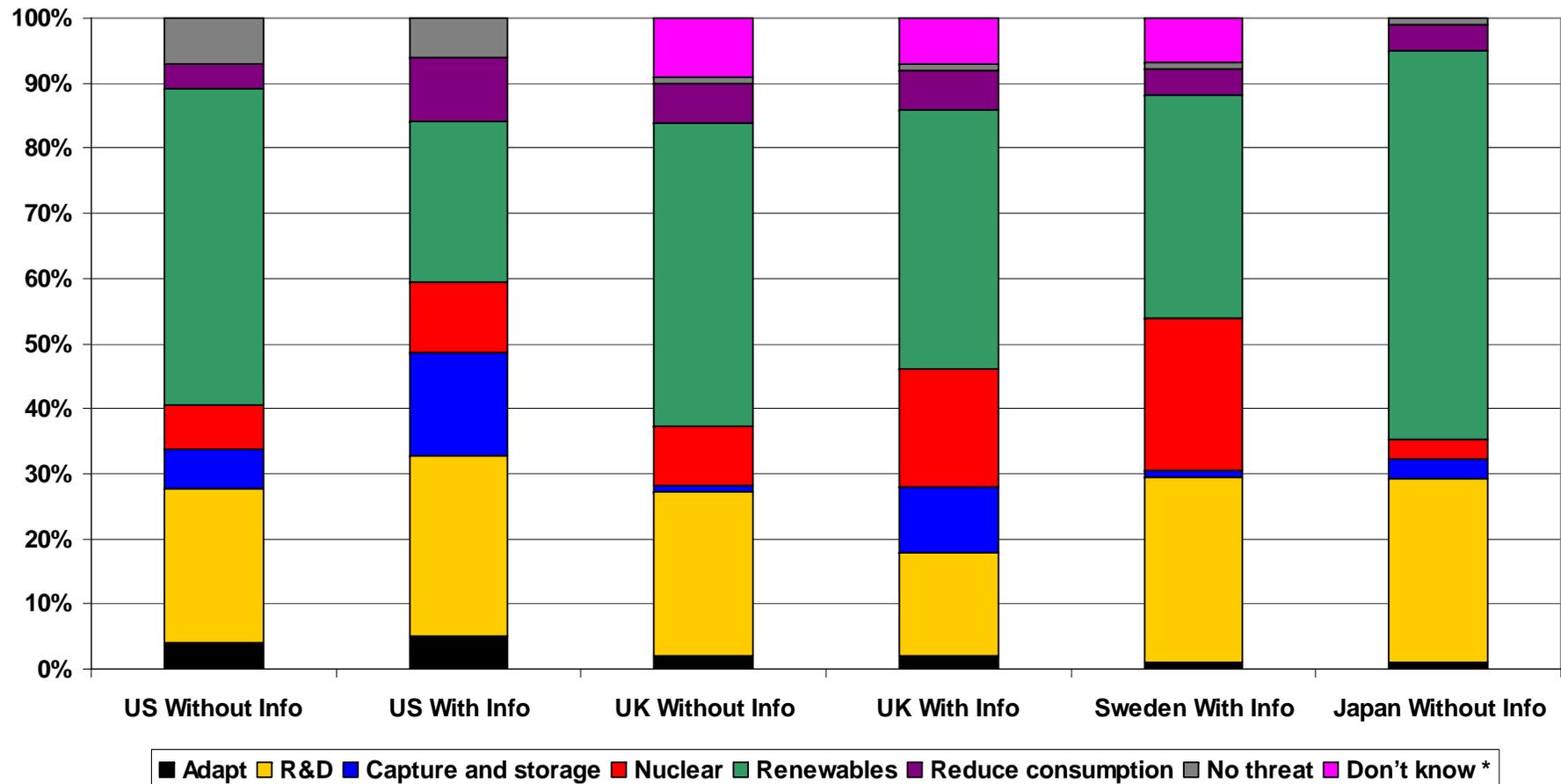
Sweden

Japan



■ Definitely use 
 ■ Probably use 
  Not sure 
 ■ Probably not use 
 ■ Definitely not use

# How can we best address the issue of global warming as it relates to electricity production?



\* Don't know not included in the US or Japan surveys

# Summary

- Quite similar technology preferences:
  - Renewables most popular option
  - Publics divided over use of CCS but many “unsure”
  - Similarly low levels of awareness of CCS in US and UK, slightly higher in Sweden, much higher in Japan
  - Shift to nuclear and CCS with more information in US and UK

# Outline

- Public Attitude toward and Understanding of Climate Change
- Public Awareness of CO<sub>2</sub> Capture and Storage (CCS)
- **Implications for Public Acceptance**

# Starting Point

- Public unfamiliar with CCS
- Most people have no opinion on CCS
- For people with opinions, 50% favorable, 50% unfavorable

# Press Coverage of IPCC Special Report

- CO<sub>2</sub> Storage May Minimize Climate Change – *UNEP*
- Carbon Capture has a Big Future, Say Scientists – *FT*
- New blueprint for storing carbon – *ABC Science Online (Australia)*
- Recycled geological structures to reduce CO<sub>2</sub> – *Independent (South Africa)*
- Burying CO<sub>2</sub> May Curb Global Warming, But Cost High - *Reuters*
- Carbon dioxide storage holds limited promise: Approach could halve industrial emissions by 2050 – *Nature*

# Key Question

- Is there anything inherent in the technology to make public acceptance more difficult than for other climate change mitigation options?

# CCS is a Fossil-Fuel Technology

- First Impression
  - It will allow continued use of fossil fuel
- On Closer Inspection
  - For the foreseeable future, fossil fuels critical to world economy
  - CCS allows use of fossil fuels in an environmentally sensitive manner

# CCS Creates a Long-Term Waste

- First Impression
  - Like nuclear, we are burying the solution and creating a negative legacy for future generations
- On Closer Inspection
  - Compared to nuclear waste, the risks from geological storage are very small
  - Over time, geologic mechanisms actually reduce risk

# CCS is an Unknown Quantity

- First Impression
  - Are you serious? You are going to put all that CO<sub>2</sub> into the ground?
- On Closer Inspection
  - Analogous operations happening today – Enhanced Oil Recovery, Natural Gas Storage, Acid Gas Injection plus Sleipner, In-Salah, Weyburn
  - Projected costs comparable with other large-scale mitigation options

# CCS is not Renewables

- First Impression
  - Renewables will solve the climate change problem
- On Closer Inspection
  - There are technical and economic limitations for renewables
  - CCS should be viewed as part of a portfolio to complement (not replace) renewables
  - Major competitor to CCS is nuclear

# NUMBY

- First Impression
  - Not Under My Back Yard
- On Closer Inspection
  - Out of sight, out of mind
  - Fear factor may be an issue (even if more perceived than real)
  - No technology escapes NIMBY

# CCS Framing & Acceptance

- Opinion surveys problematic due to CCS being an unknown quantity
- Early opinions will be informed by how first projects are perceived
- The case needs to be made that CCS is an important technology to address climate change problem

# Moving Forward

- CCS remains low on the public radar and is at a stage when the image developed in the media or the public consciousness can have long-lasting impact.
- Early successes/failures will disproportionately influence attitudes at this stage
- However, even growing general acceptability does not guarantee local acceptability
- CCS acceptance is likely to improve if it is associated with existing accepted technologies (i.e., presented as part of a portfolio)

# Contact Information

- Web Site - [sequestration.mit.edu](http://sequestration.mit.edu)
- Contact
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