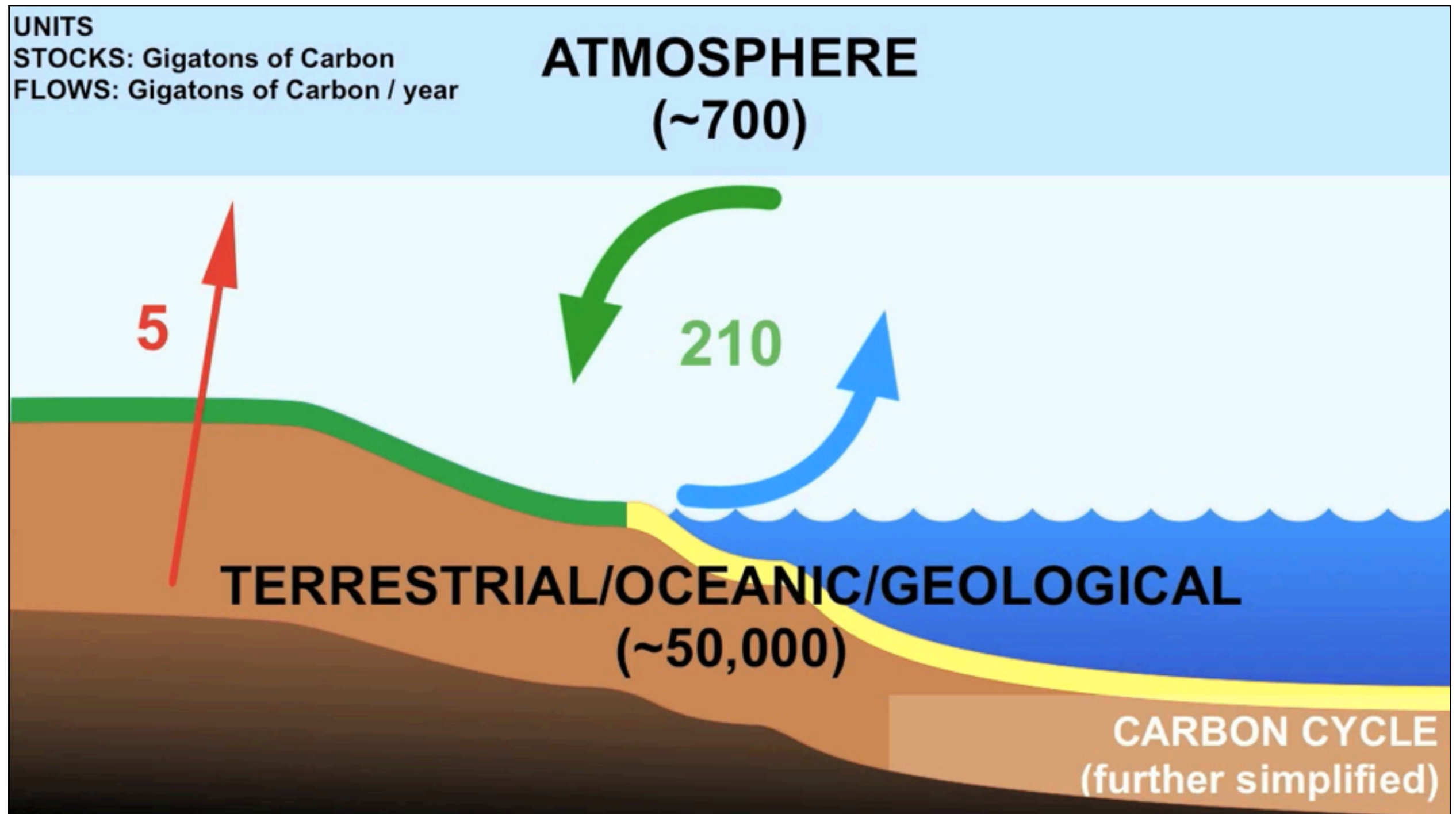


# The Education Leverage Point: Climate Change



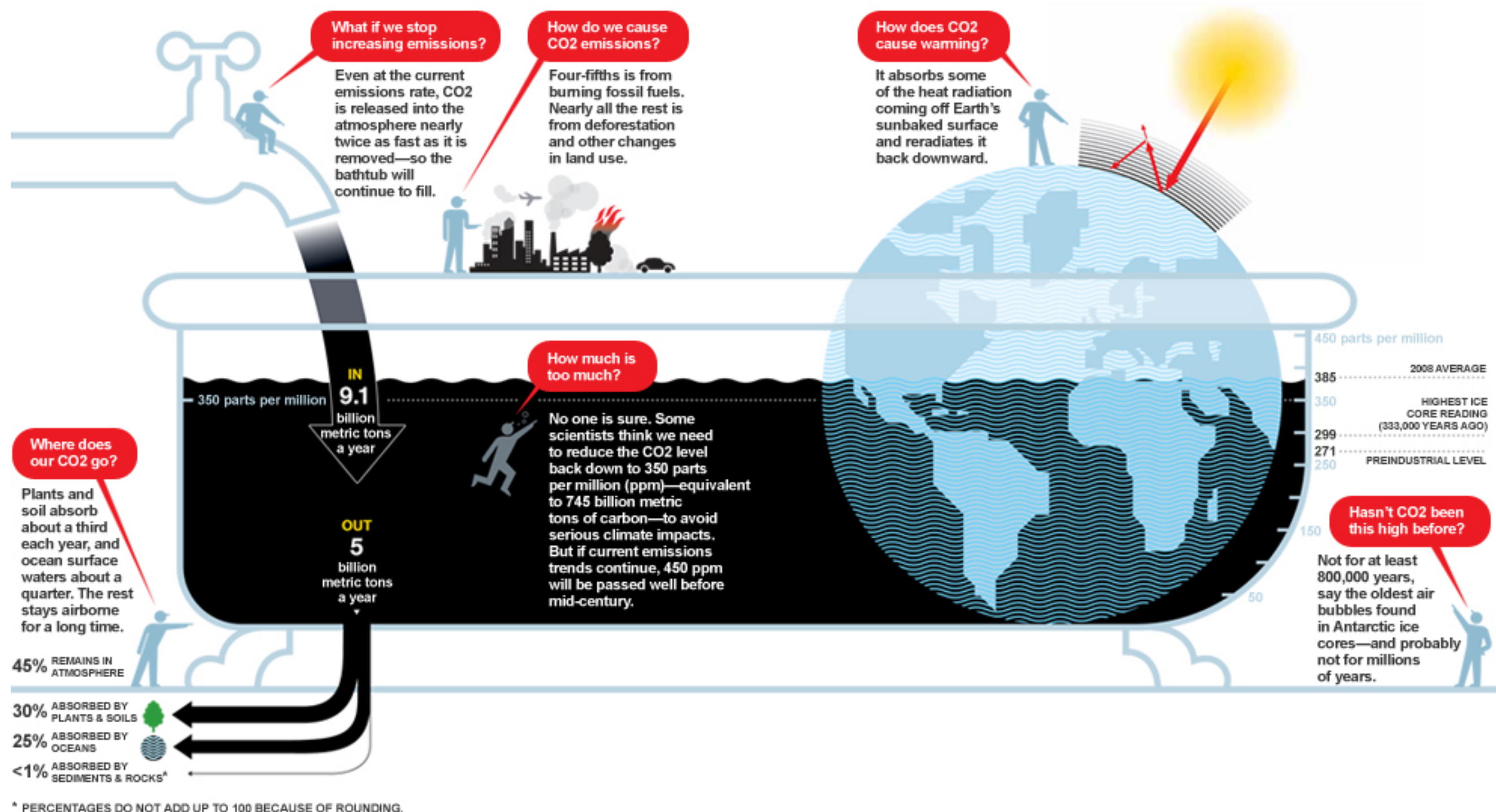
Chris Browne, Barry Newell & Paul Compston  
Australian National University  
SEng 2013 Conference

# Super-Simple Carbon Cycle



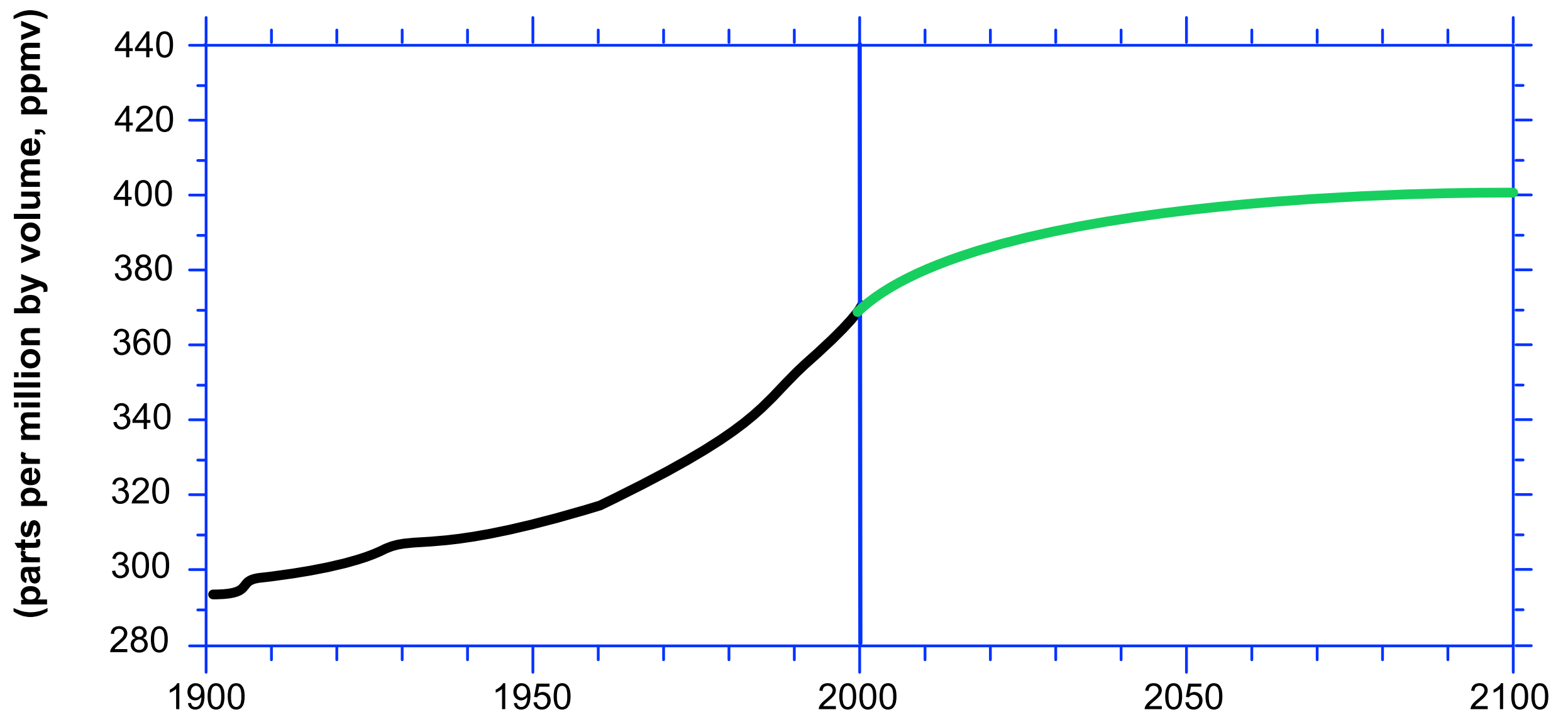


# The Bathtub Metaphor



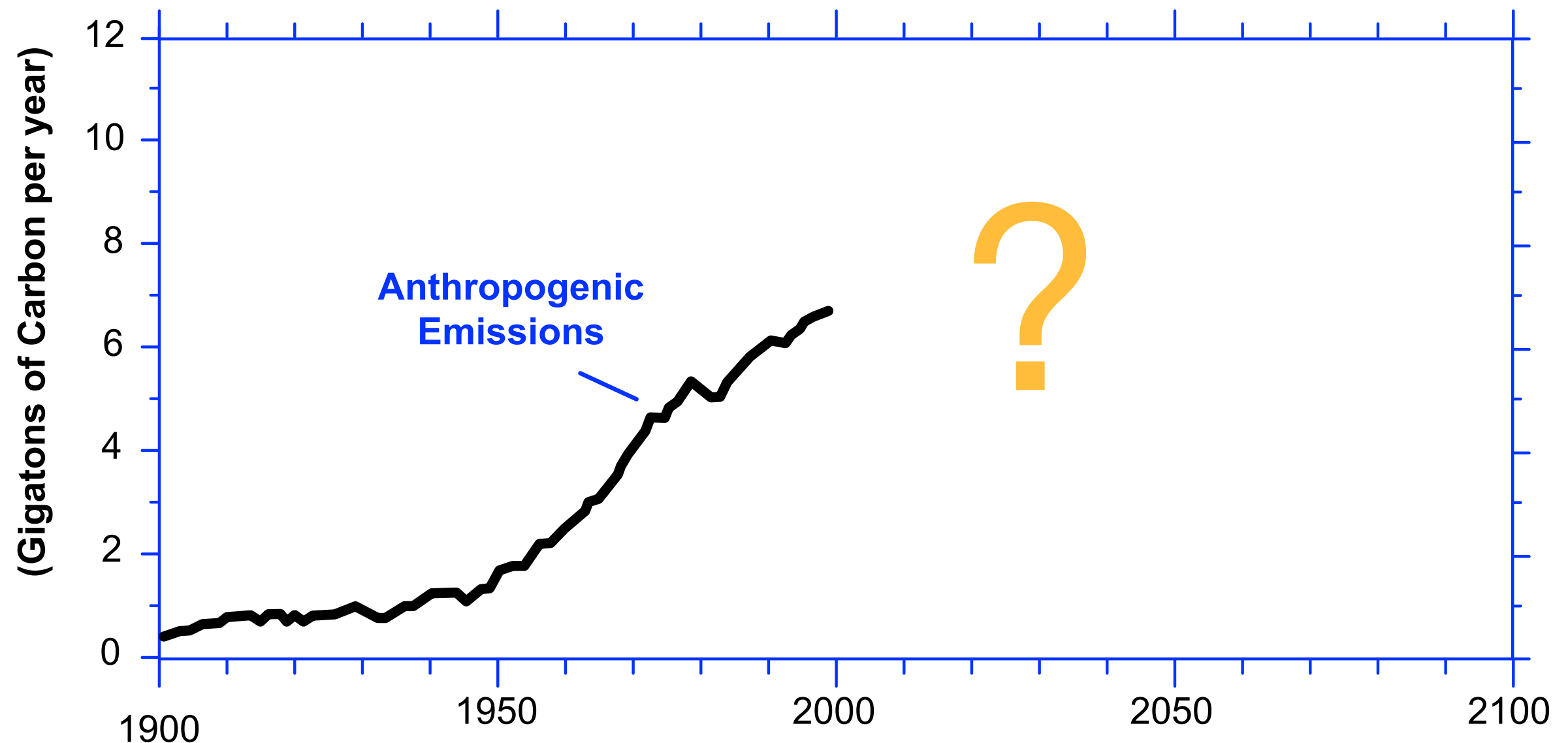
# Atmospheric CO<sub>2</sub> Concentrations

## Anticipated trajectory to achieve 400ppm



# Anthropogenic CO<sub>2</sub> Emissions

## Possible solutions?



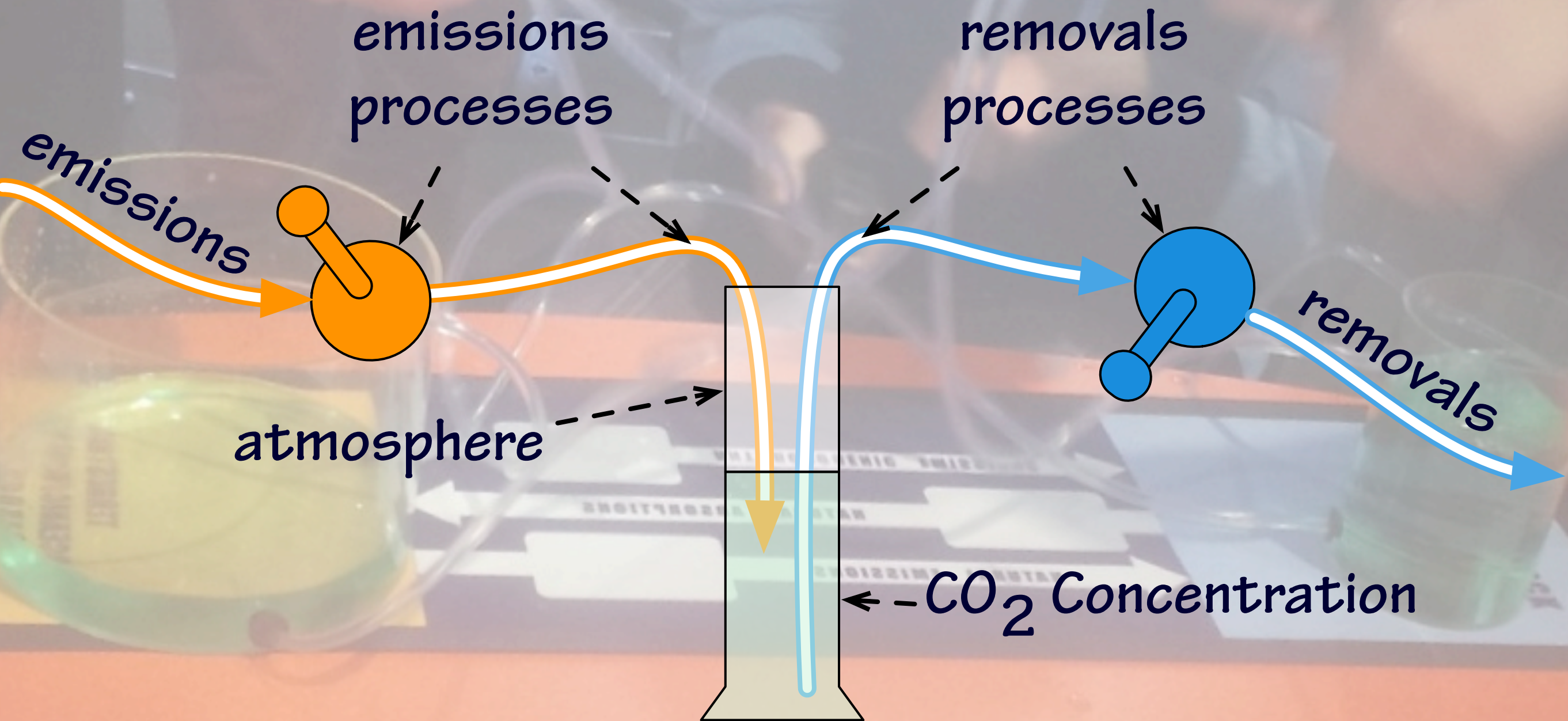






# Tubs & Pumps

## A Physical Analogue



# Metaphorical Mapping



Carbon in the atmosphere (natural cycle)	Tubs & Pumps parts
Carbon in the atmosphere	
Natural removals	
Natural additions	
Carbon stored in ocean/geology/land/soil	
Anthropogenic additions	



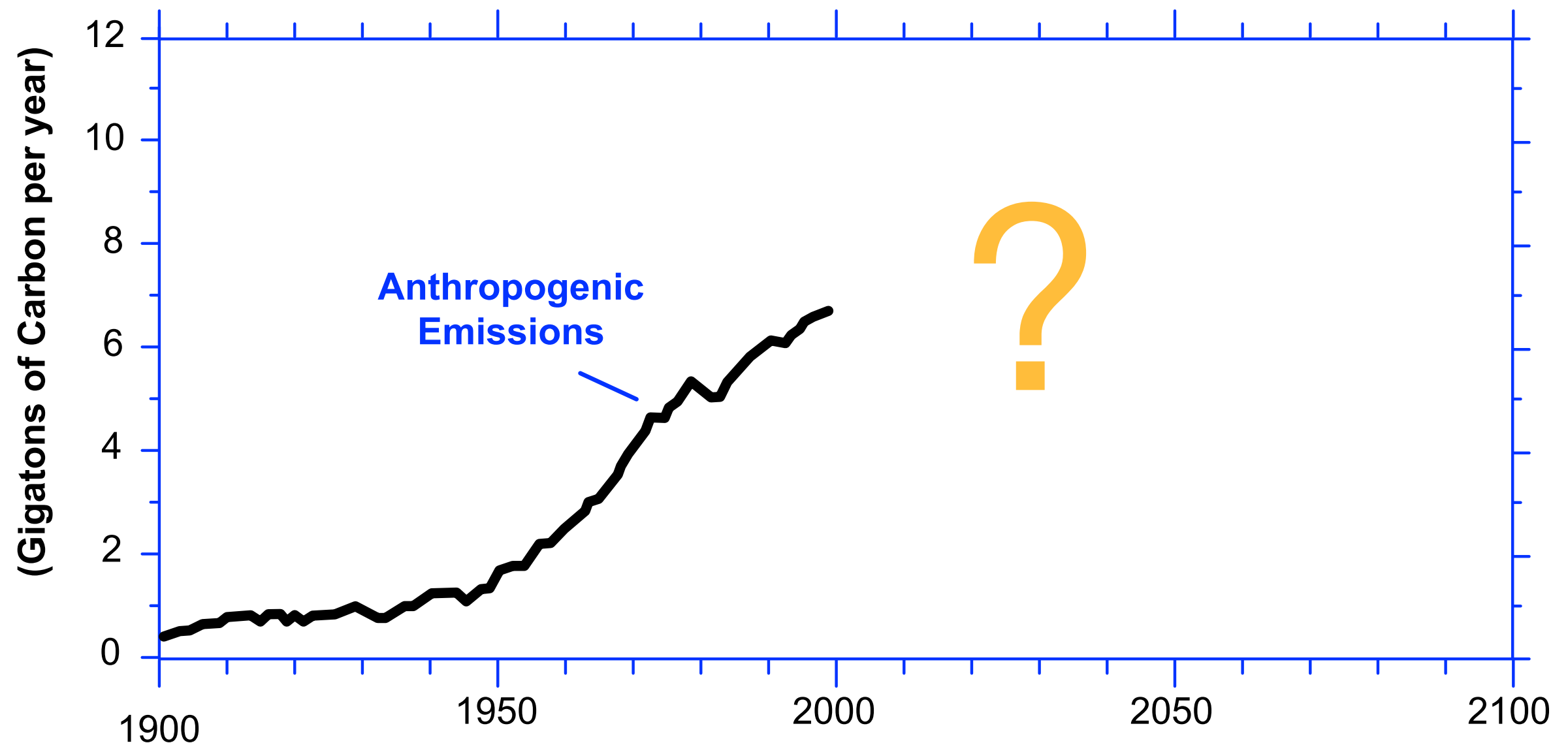
# Metaphorical Mapping



Carbon in the atmosphere (natural cycle)	Tubs & Pumps parts
Carbon in the atmosphere	Small tub
Natural removals	OUT pump
Natural additions	IN pump
Carbon stored in ocean/geology/land/soil	Large tub
Anthropogenic additions	IN pump

# Anthropogenic CO<sub>2</sub> Emissions

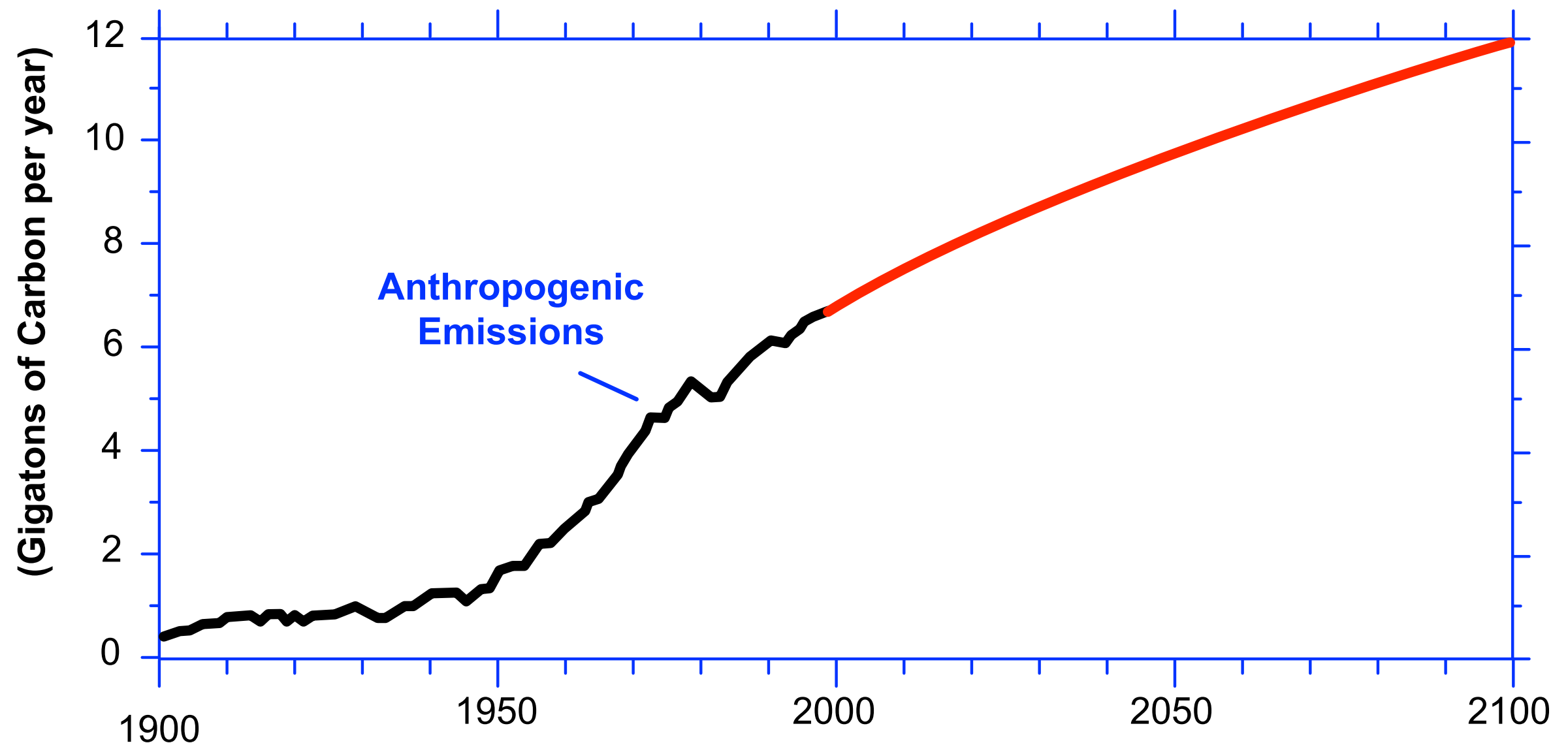
## Possible solutions?





# Anthropogenic CO<sub>2</sub> Emissions

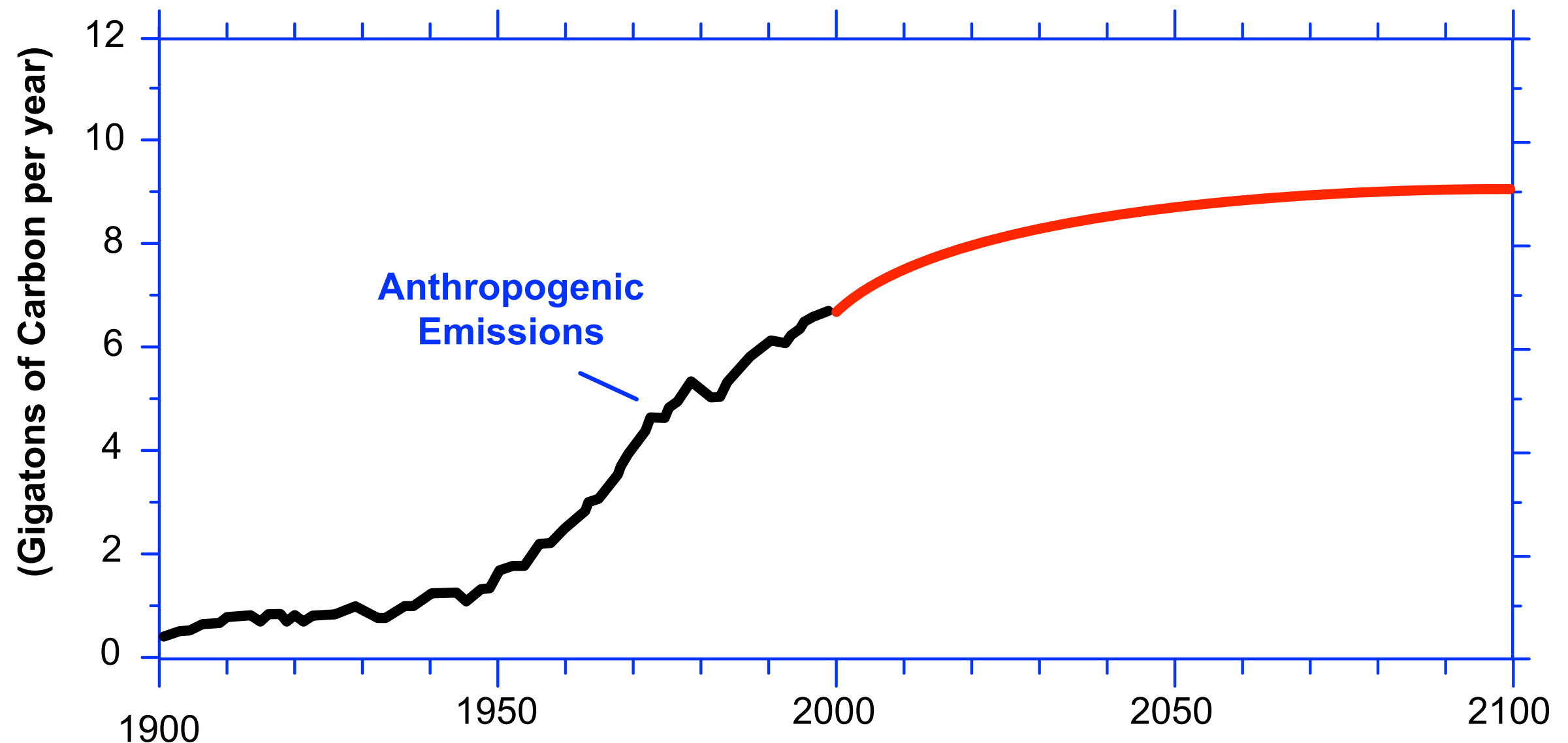
## 'Slow down growth' solution



Adapted from: STERMAN, J. & BOOTH SWEENEY, L. (2007) Understanding Public Complacency About Climate Change: Adults' Mental Models of Climate Change Violate Conservation of Matter. *Climatic Change*, 80, 213-238.

# Anthropogenic CO<sub>2</sub> Emissions

## 'Level-out' solution

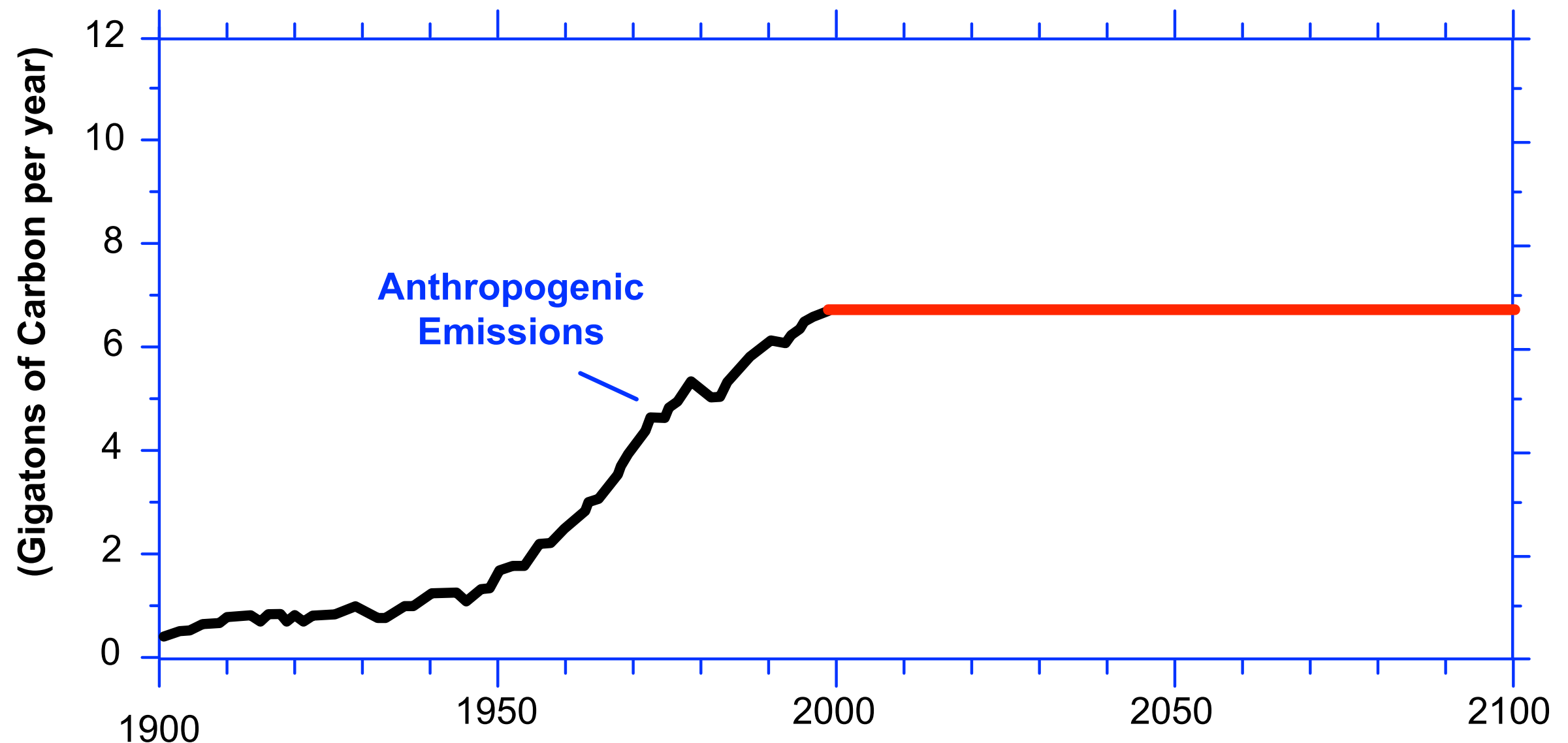


Adapted from: STERMAN, J. & BOOTH SWEENEY, L. (2007) Understanding Public Complacency About Climate Change: Adults' Mental Models of Climate Change Violate Conservation of Matter. *Climatic Change*, 80, 213-238.



# Anthropogenic CO<sub>2</sub> Emissions

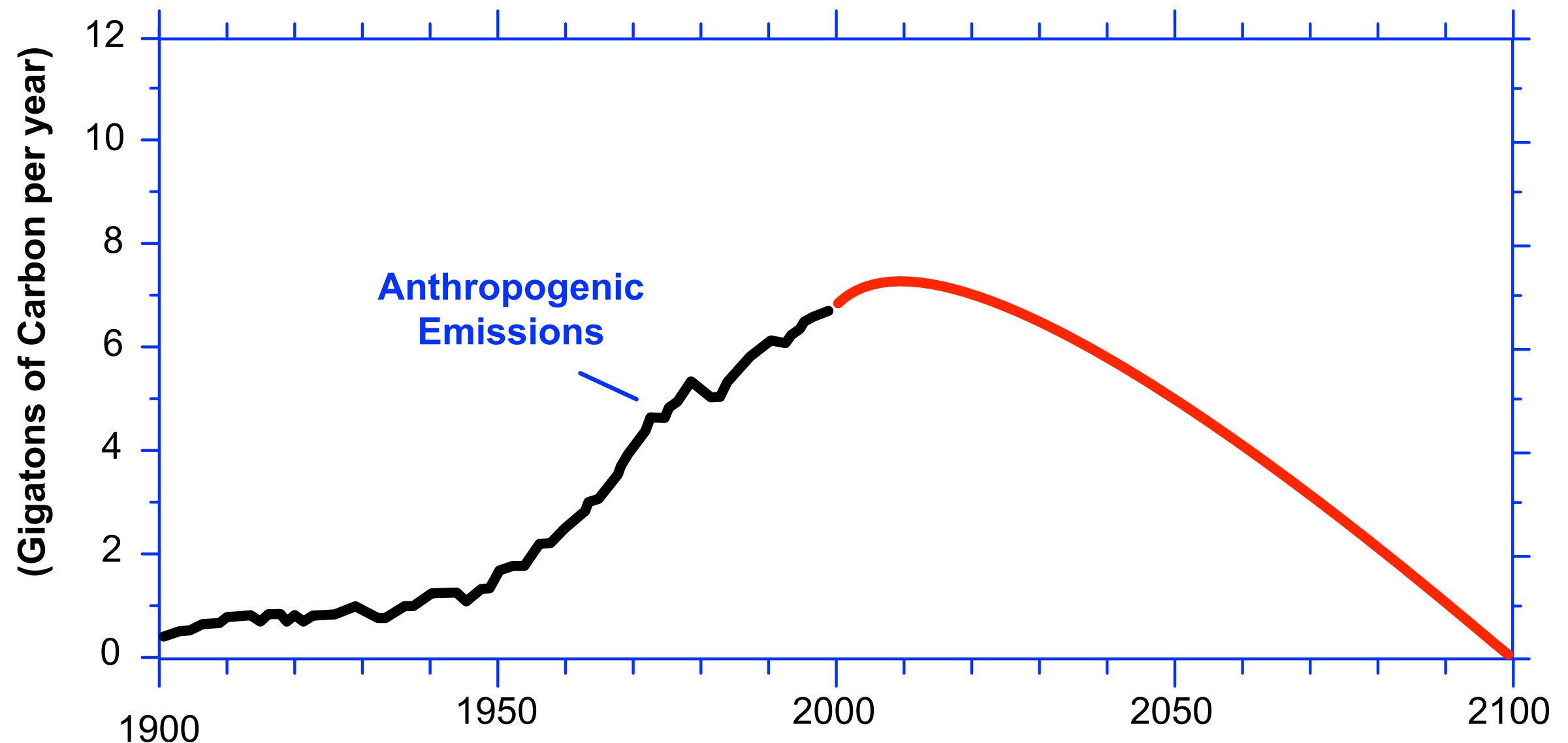
## 'Flat' solution



Adapted from: STERMAN, J. & BOOTH SWEENEY, L. (2007) Understanding Public Complacency About Climate Change: Adults' Mental Models of Climate Change Violate Conservation of Matter. *Climatic Change*, 80, 213-238.

# Anthropogenic CO<sub>2</sub> Emissions

## Slow to react, rapid decline

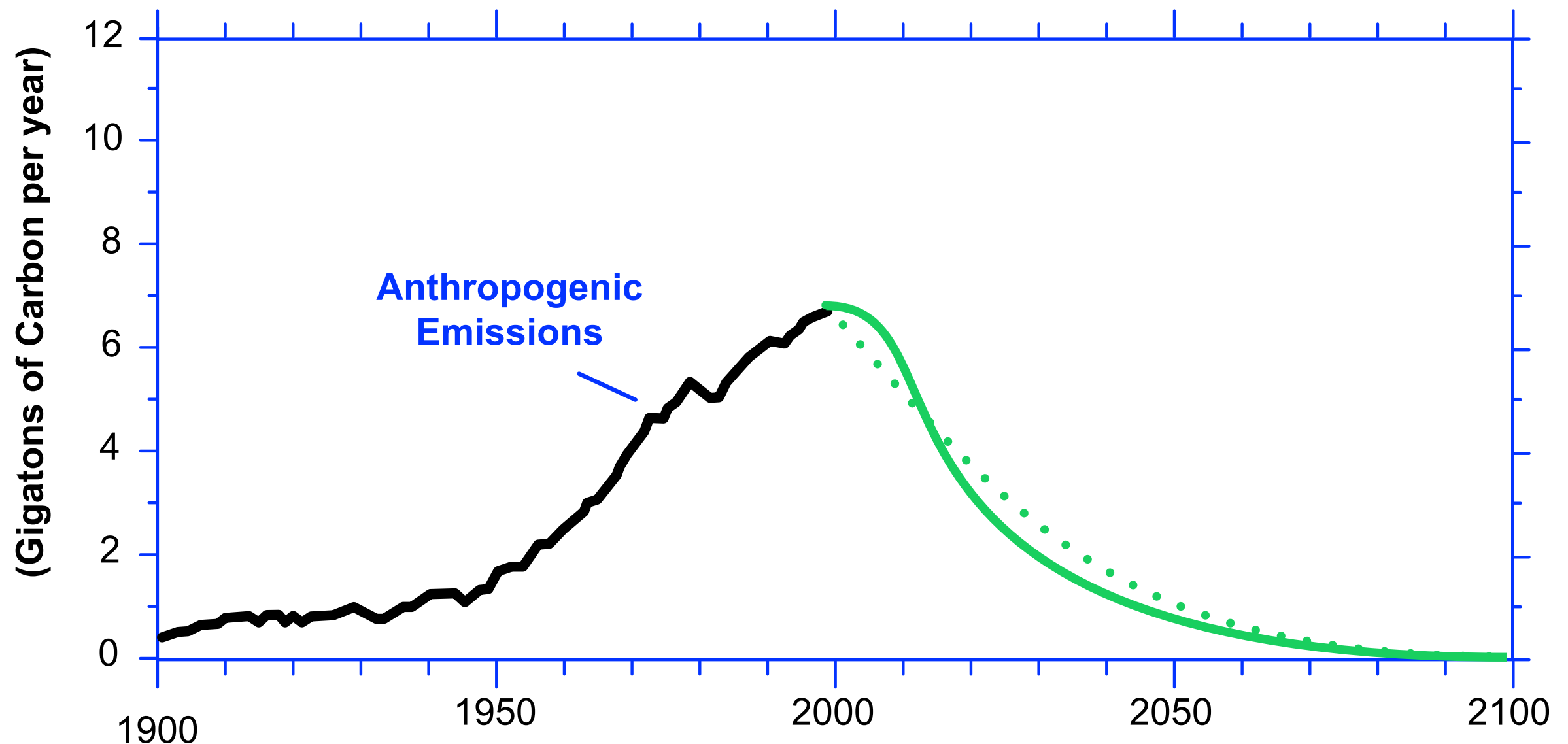


Adapted from: STERMAN, J. & BOOTH SWEENEY, L. (2007) Understanding Public Complacency About Climate Change: Adults' Mental Models of Climate Change Violate Conservation of Matter. *Climatic Change*, 80, 213-238.

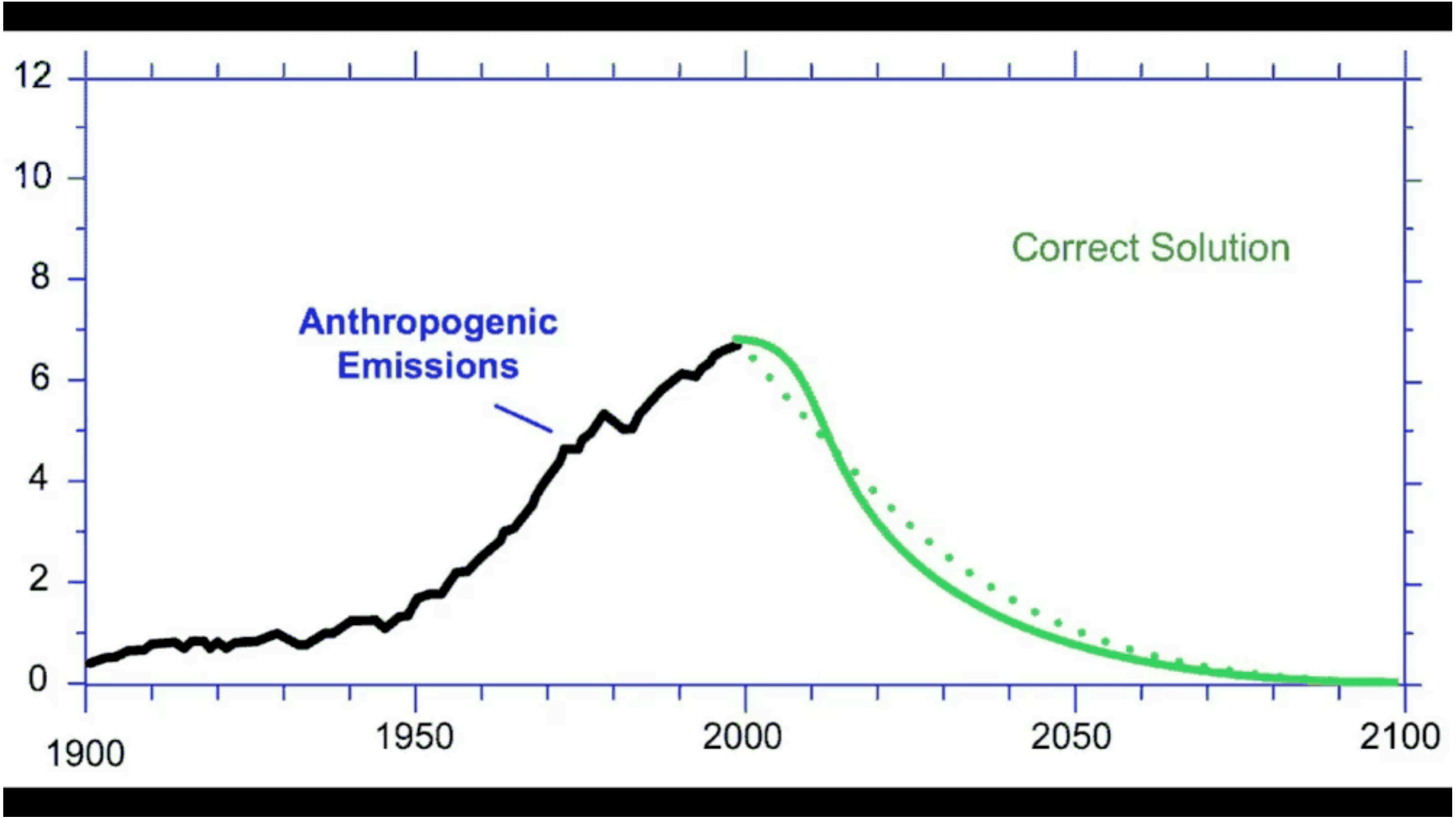


# Anthropogenic CO<sub>2</sub> Emissions

## 'Immediate action' solution



Adapted from: STERMAN, J. & BOOTH SWEENEY, L. (2007) Understanding Public Complacency About Climate Change: Adults' Mental Models of Climate Change Violate Conservation of Matter. *Climatic Change*, 80, 213-238.





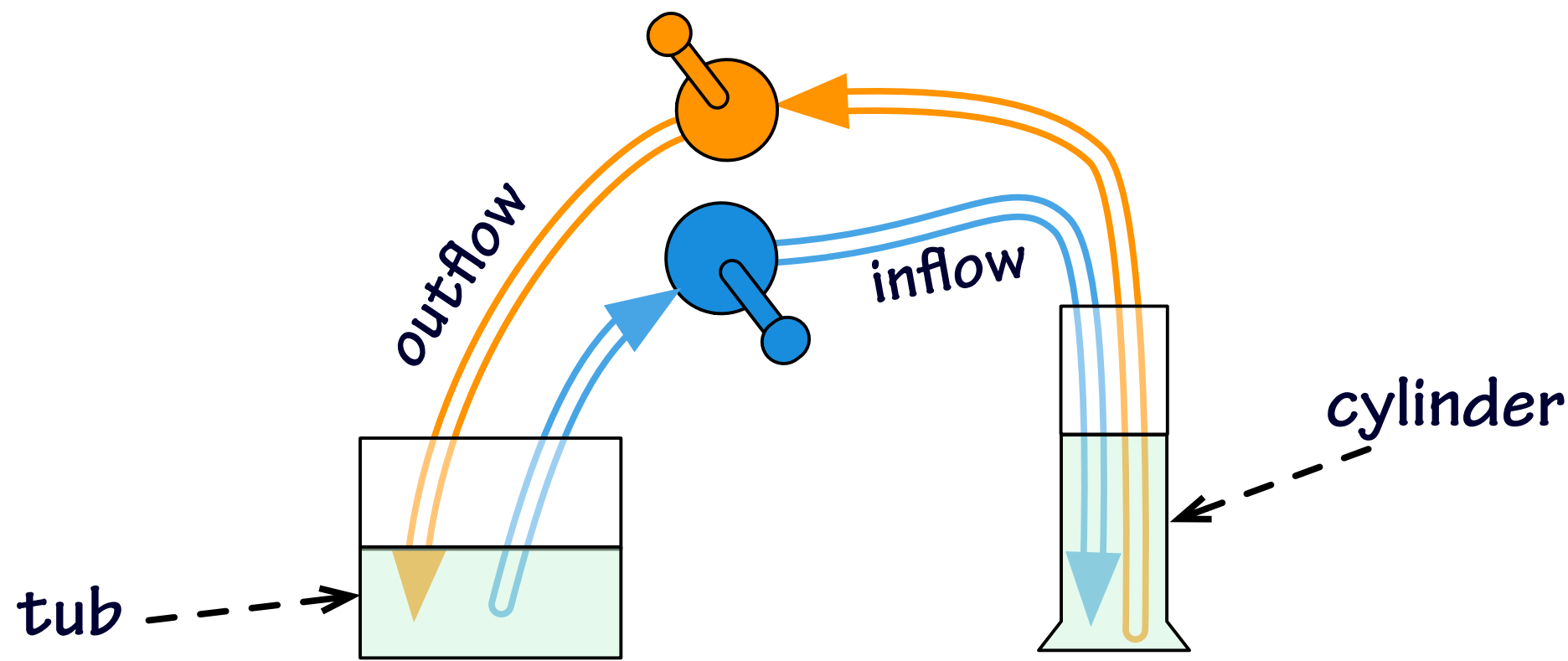
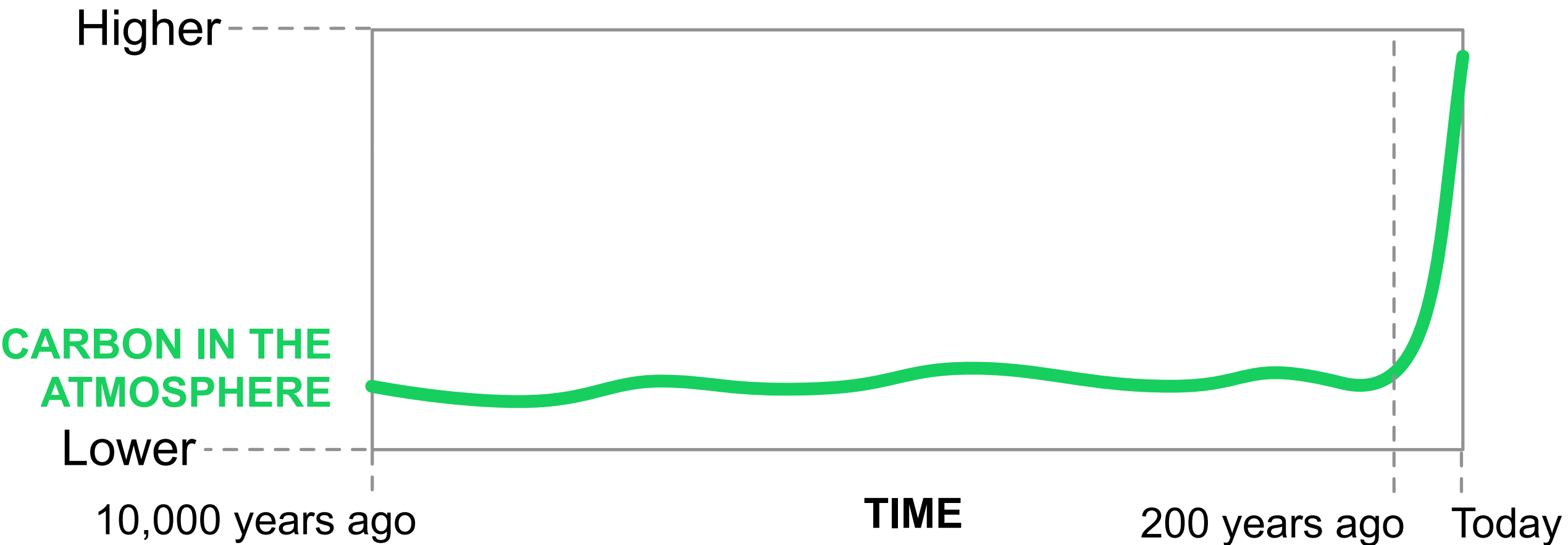
# Interesting Observation

	Correct	Incorrect				Total
		Decrease	Stabilise	Increase	Other	
Matched	83	29	26	2	0	140
Mostly Matched	4	107	2	3	1	117
Mismatched	0	39	93	73	3	208
Other	0	6	6	2	6	20
Total	87	181	127	80	10	485

Participants who got it right, had a strong match between written and graph.

Participants who got it wrong, tended to have a mismatch between written and graph

# **Would Electric Cars make a difference?**





## **We're looking for more groups!**



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W: <http://cecs.anu.edu.au/user/4172>

W: <http://tubsandpumps.info> (coming soon)

SEng 2013 Conference

18 September, Canberra