

# Green economy

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# The Green economy

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## □ Definitions

- Common to all is the idea of sustainability
- Can contain social elements but principally looking at the interaction between the economy and the environment

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- **Definitions**
  - Common to all is the idea of sustainability
  - Can contain social elements but principally looking at the interaction between the economy and the environment
- **History probably dates back to before Malthus**
  - The Malthusian trap 1798
  - The population bomb Paul Ehrlich 1968
  - Limits to Growth, Club of Rome, 1972
  - The Economics of Climate Change, Stern 2006

# The Green economy

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## □ Malthus's happy prediction:

- "The power of population is so superior to the power of the earth to produce subsistence for man, that premature death must in some shape or other visit the human race. The vices of mankind are active and able ministers of depopulation. They are the precursors in the great army of destruction, and often finish the dreadful work themselves. But should they fail in this war of extermination, sickly seasons, epidemics, pestilence, and plague advance in terrific array, and sweep off their thousands and tens of thousands. Should success be still incomplete, gigantic inevitable famine stalks in the rear, and with one mighty blow levels the population with the food of the world."
- "The great law of necessity which prevents population from increasing in any country beyond the food which it can either produce or acquire, is a law so open to our view...that we cannot for a moment doubt it."

An essay on the principle of population, 1798

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## □ Paul Ehrlich:

- "The battle to feed all of humanity is over. In the 1970s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now. At this late date nothing can prevent a substantial increase in the world death rate."

## The Population Bomb, 1968

- Also famous for the Simon–Ehrlich wager (on commodity prices over the 1990s) – which he lost

# The Green economy

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- **The limits to growth (1972):**
  - world population, industrialization, pollution, food production and resource depletion growing exponentially
  - New resources growing linearly
  - Used model to show different paths and their consequences

# The rule of 70 was and is behind a lot of the thinking

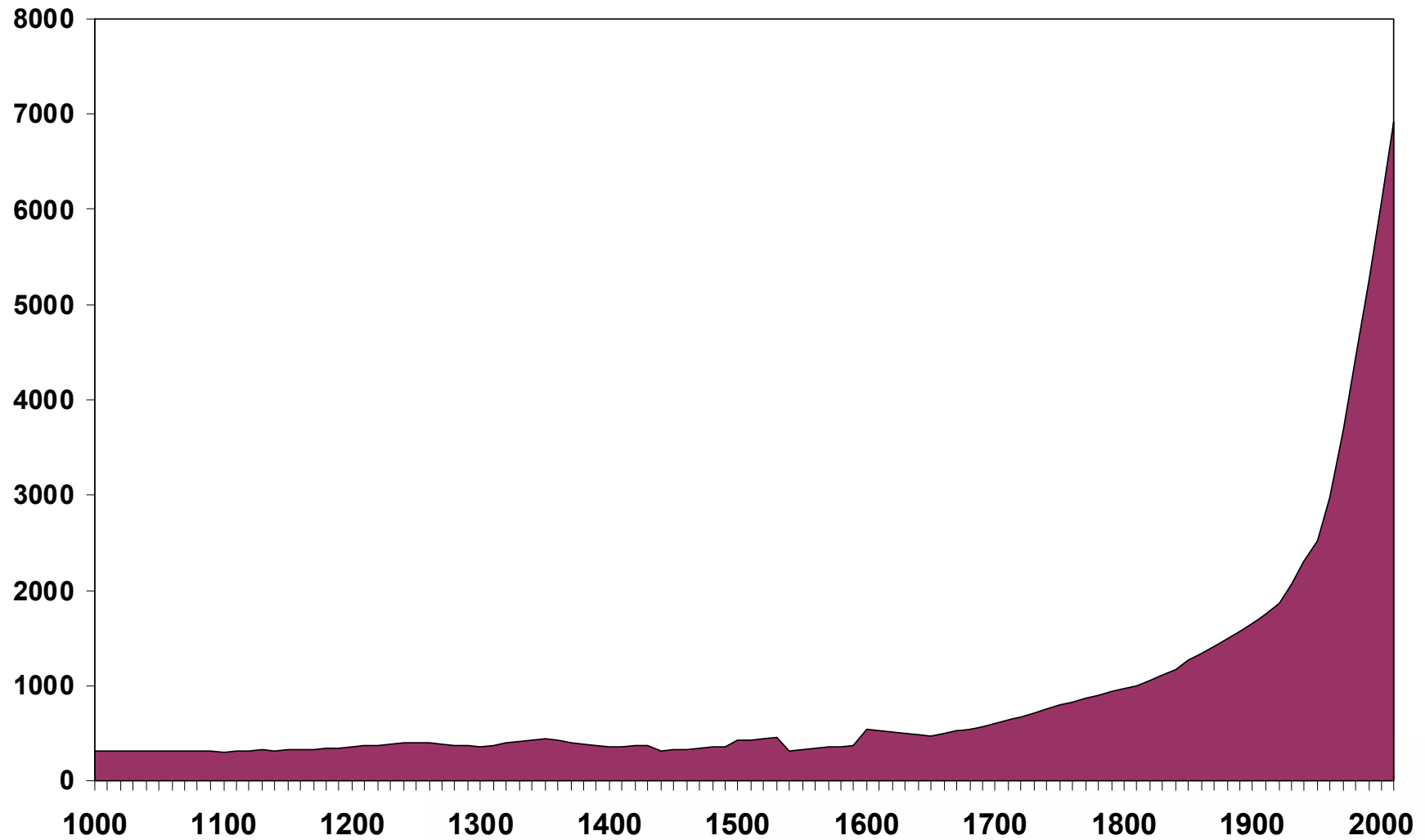
Rule of 70: years needed to double output			
Growth rate %	Rule of 70 (70/growth)	Actual (calculated)	
1	70	69.7	
2	35	35.0	
3	23	23.4	
4	18	17.7	
5	14	14.2	
6	12	11.9	
7	10	10.2	
8	9	9.0	
9	8	8.0	
10	7	7.3	
11	6	6.6	
12	6	6.1	
13	5	5.7	
14	5	5.3	
15	5	5.0	
70	1	1.3	

Last doubling cycle = > sum of previous doublings		
Doubling		Cumulative
1		
2	>	1
4	>	3
8	>	7
16	>	15
32	>	31
64	>	63
128	>	127
256	>	255
512	>	511
1024	>	1023

# Massive rise in population during the 20<sup>th</sup> century

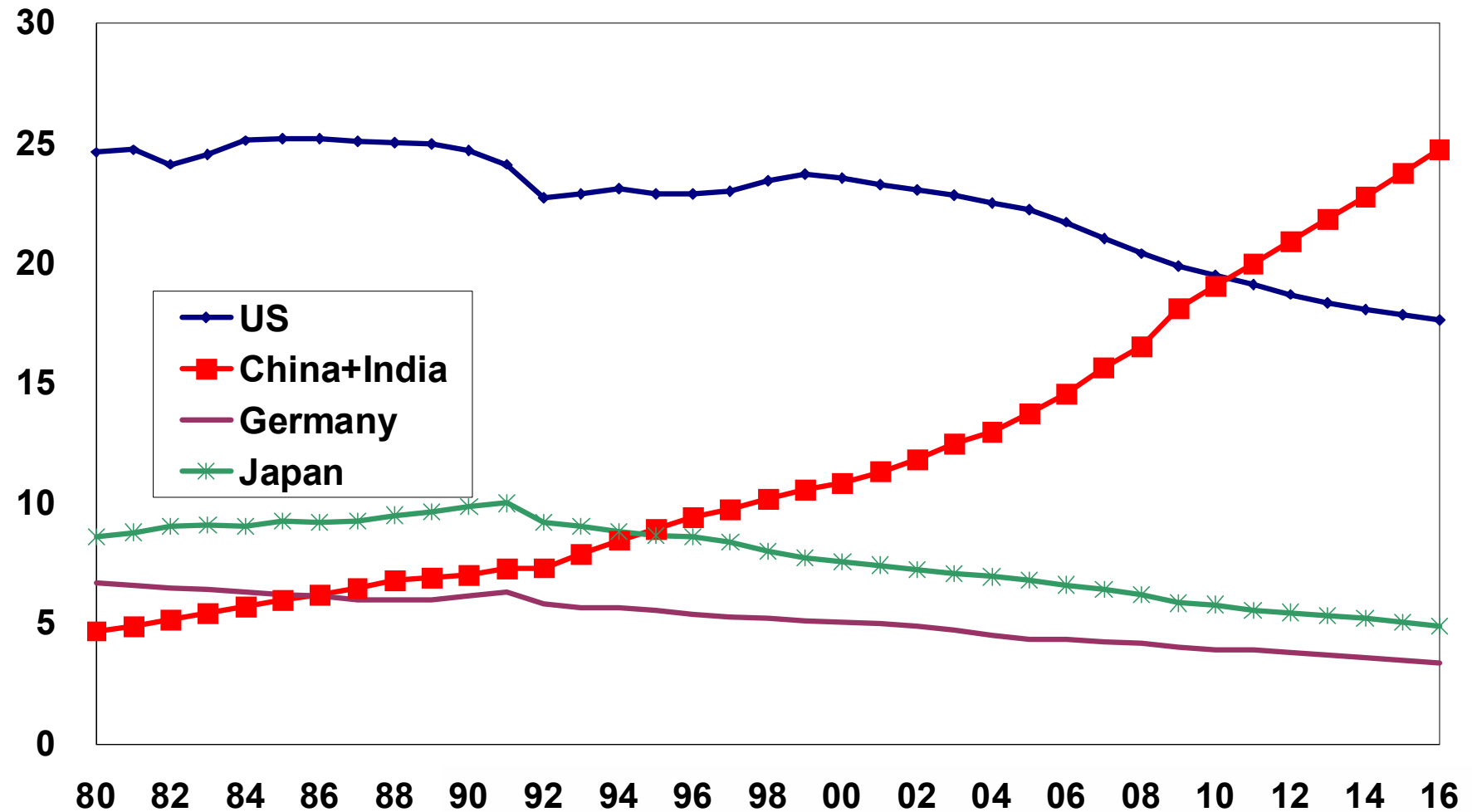
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Population explosion over the past century (millions)



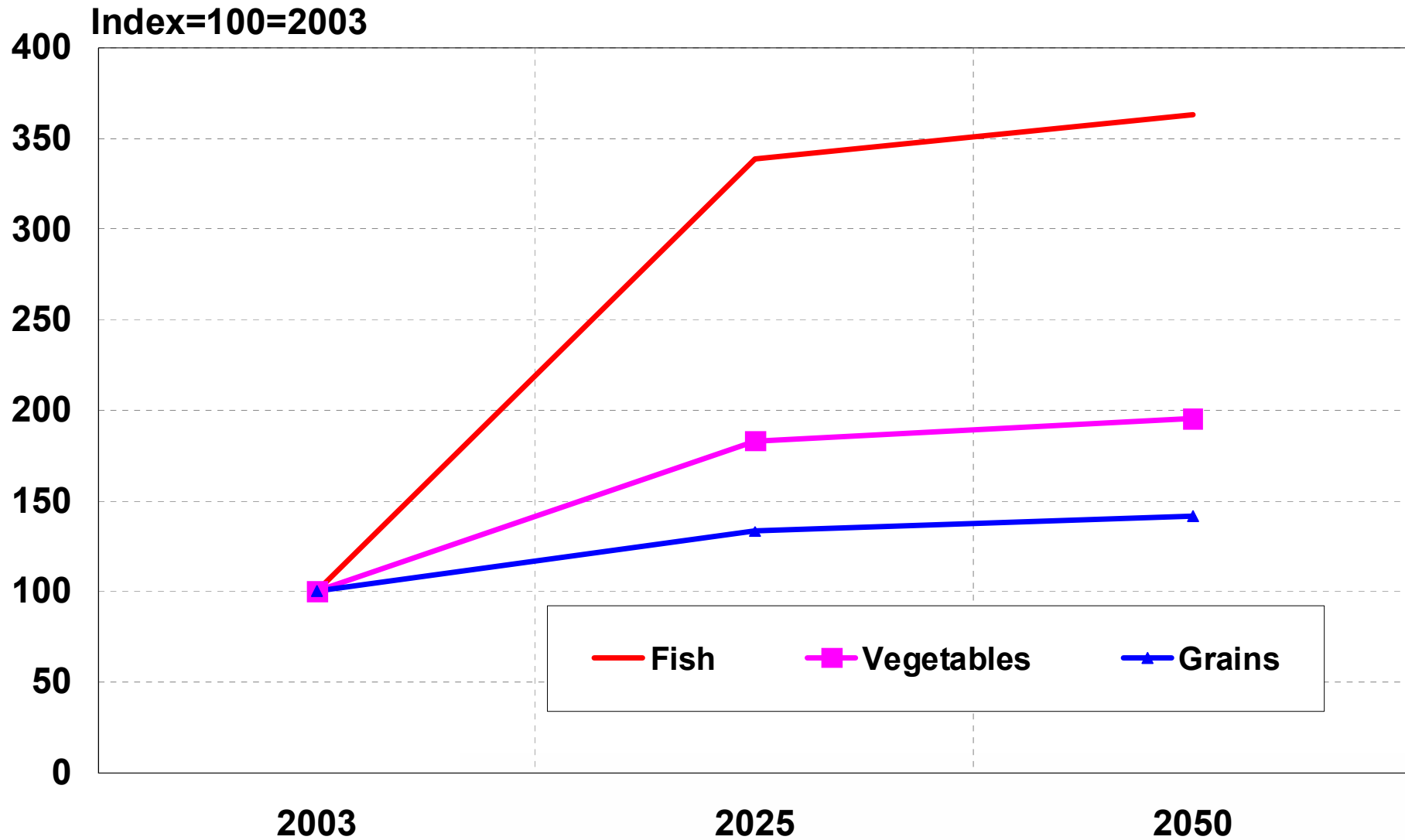
# The masses are growing more affluent

Emerging Asia growing in dominance: % of global gdp (PPP measure)

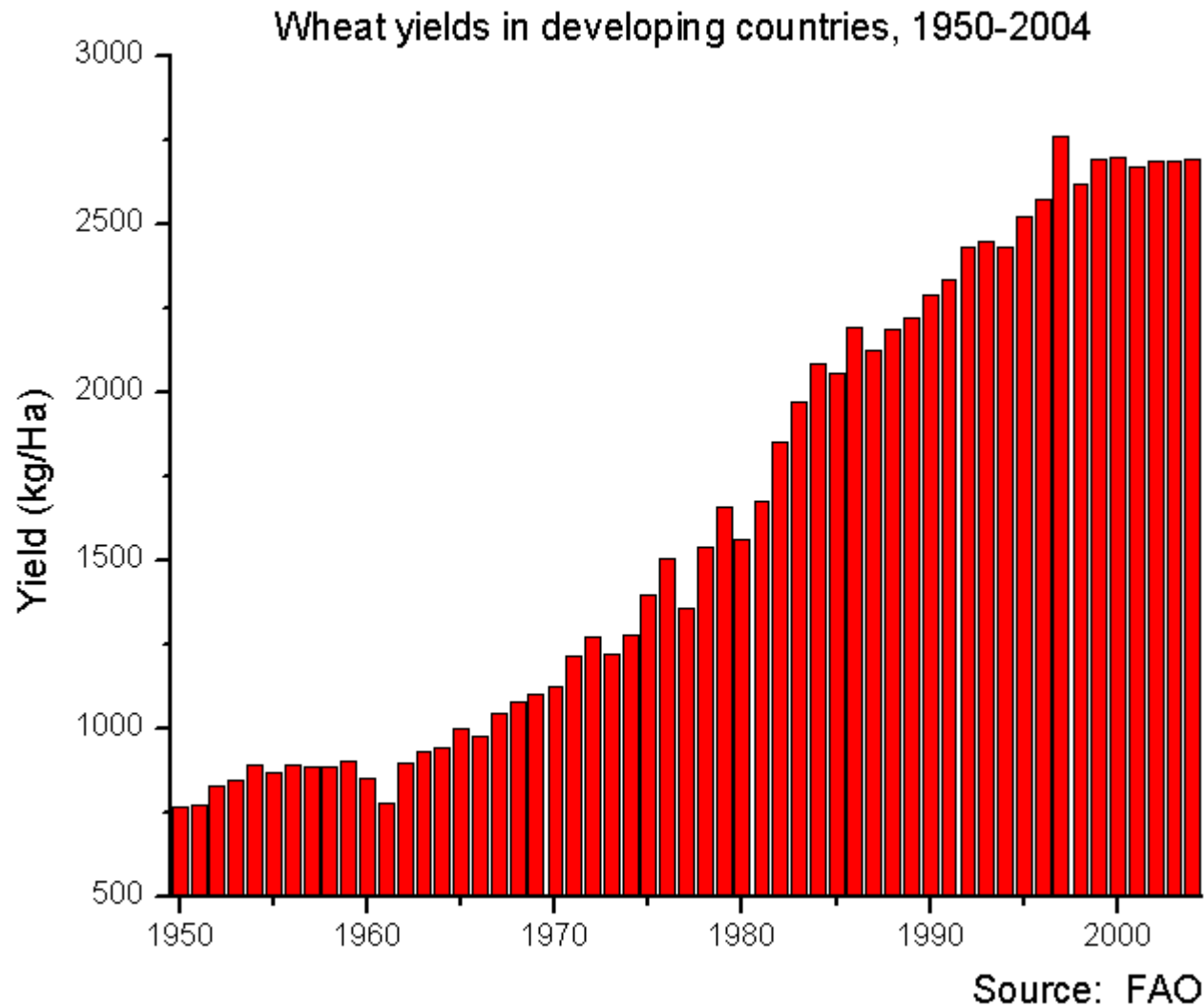


Source: IMF WEO September 2011

# With potentially significant effects - Chinese food consumption projections



# However, technology and substitution have largely staved off the doomsayers so far



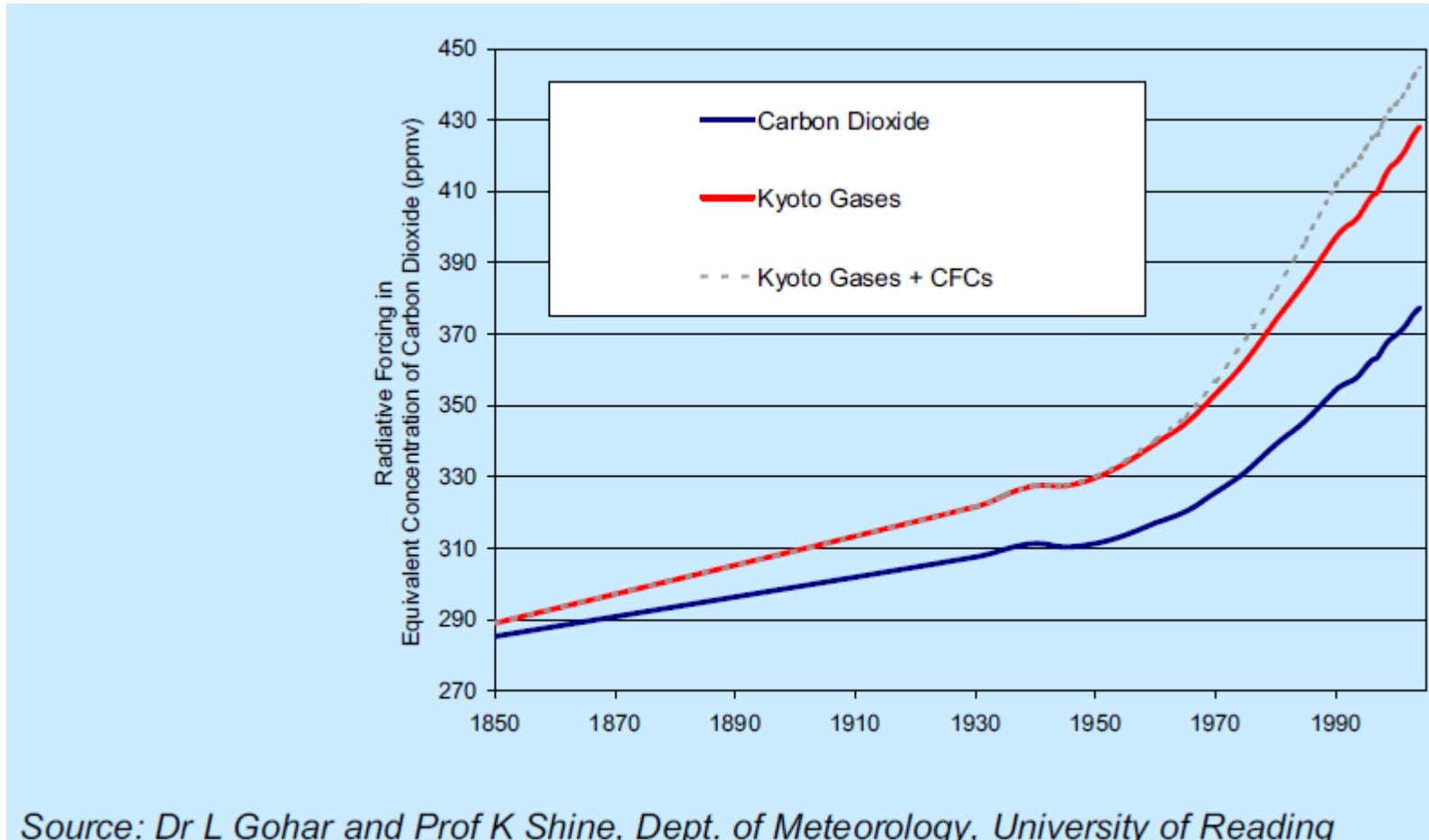
## Earlier fears still apply, but focus in the 1990s turned to the effects of climate change

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### The Stern report (2006):

- Greenhouse emissions have externality effects resulting in massive costs working through climate change
  - Global in consequences
  - Long-term and persistent
  - Significant uncertainties and risks including irreversible change
  - Non-marginal economic impact
  - Intergenerational impact
- Impact:
  - Water sources
  - Food production
  - Health
  - Environment

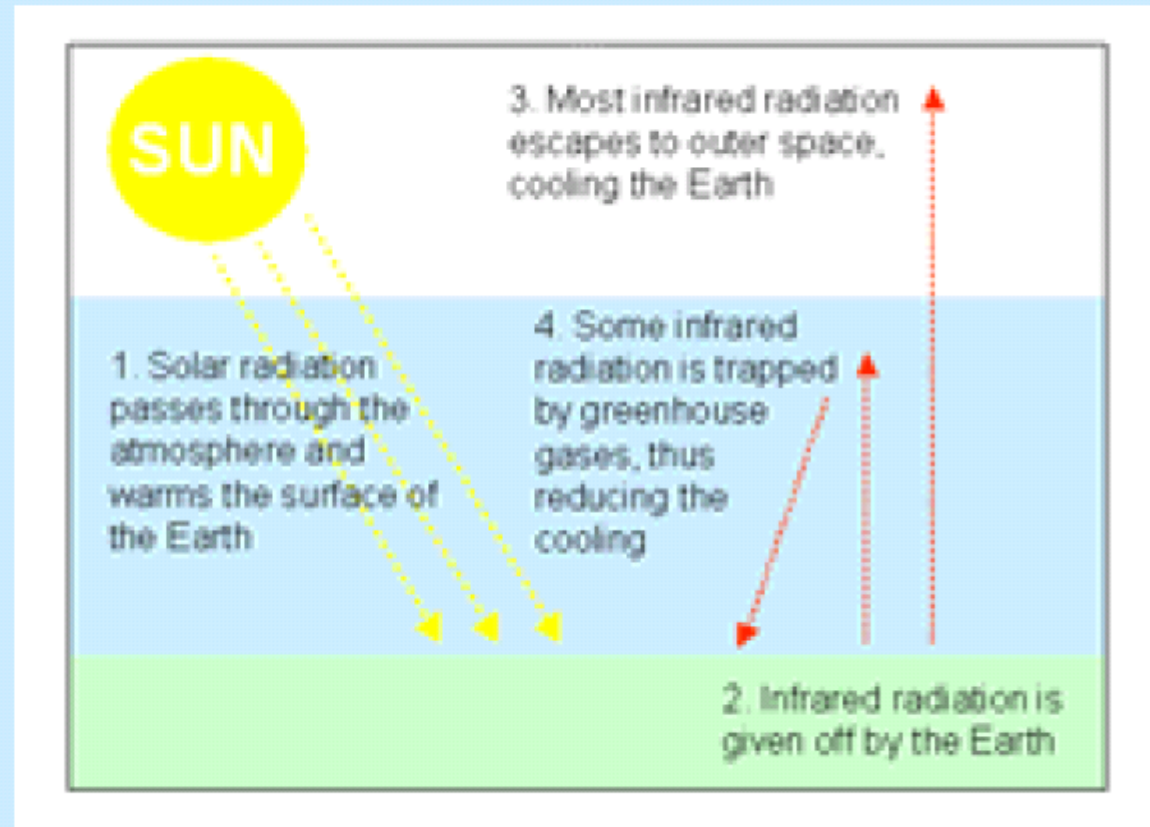
# Industrialisation and population growth have driven gas emissions



Source: Stern pg 4

# Increasing climate change

Figure 1.2 The Greenhouse Effect



Source: Based on DEFRA (2005)

Source: Stern pg 4

# Effects of climate change

**Table 3.1 Highlights of possible climate impacts discussed in this chapter**

Temp rise (°C)	Water	Food	Health	Land	Environment	Abrupt and Large-Scale Impacts
1°C	Small glaciers in the Andes disappear completely, threatening water supplies for 50 million people	Modest increases in cereal yields in temperate regions	At least 300,000 people each year die from climate-related diseases (predominantly diarrhoea, malaria, and malnutrition)  Reduction in winter mortality in higher latitudes (Northern Europe, USA)	Permafrost thawing damages buildings and roads in parts of Canada and Russia	At least 10% of land species facing extinction (according to one estimate)  80% bleaching of coral reefs, including Great Barrier Reef	Atlantic Thermohaline Circulation starts to weaken
2°C	Potentially 20 - 30% decrease in water availability in some vulnerable regions, e.g. Southern Africa and Mediterranean	Sharp declines in crop yield in tropical regions (5 - 10% in Africa)	40 – 60 million more people exposed to malaria in Africa	Up to 10 million more people affected by coastal flooding each year	15 – 40% of species facing extinction (according to one estimate)  High risk of extinction of Arctic species, including polar bear and caribou	Potential for Greenland ice sheet to begin melting irreversibly, accelerating sea level rise and committing world to an eventual 7 m sea level rise
3°C	In Southern Europe, serious droughts occur once every 10 years  1 - 4 billion more people suffer water shortages, while 1 – 5 billion gain water, which may increase flood risk	150 - 550 additional millions at risk of hunger (if carbon fertilisation weak)  Agricultural yields in higher latitudes likely to peak	1 – 3 million more people die from malnutrition (if carbon fertilisation weak)	1 – 170 million more people affected by coastal flooding each year	20 – 50% of species facing extinction (according to one estimate), including 25 – 60% mammals, 30 – 40% birds and 15 – 70% butterflies in South Africa  Onset of Amazon forest collapse (some models only)	Rising risk of abrupt changes to atmospheric circulations, e.g. the monsoon  Rising risk of collapse of West Antarctic Ice Sheet  Rising risk of collapse of Atlantic Thermohaline Circulation

# Effects of climate change 3.1 continued

Table 3.1 Highlights of possible climate impacts discussed in this chapter						
Temp rise (°C)	Water	Food	Health	Land	Environment	Abrupt and Large-Scale Impacts
4°C	Potentially 30 – 50% decrease in water availability in Southern Africa and Mediterranean	Agricultural yields decline by 15 – 35% in Africa, and entire regions out of production (e.g. parts of Australia)	Up to 80 million more people exposed to malaria in Africa	7 – 300 million more people affected by coastal flooding each year	Loss of around half Arctic tundra  Around half of all the world's nature reserves cannot fulfill objectives	Circulation
5°C	Possible disappearance of large glaciers in Himalayas, affecting one-quarter of China's population and hundreds of millions in India	Continued increase in ocean acidity seriously disrupting marine ecosystems and possibly fish stocks		Sea level rise threatens small islands, low-lying coastal areas (Florida) and major world cities such as New York, London, and Tokyo		
More than 5°C	The latest science suggests that the Earth's average temperature will rise by even more than 5 or 6°C if emissions continue to grow and positive feedbacks amplify the warming effect of greenhouse gases (e.g. release of carbon dioxide from soils or methane from permafrost). This level of global temperature rise would be equivalent to the amount of warming that occurred between the last age and today – and is likely to lead to major disruption and large-scale movement of population. Such "socially contingent" effects could be catastrophic, but are currently very hard to capture with current models as temperatures would be so far outside human experience.					

*Note: This table shows illustrative impacts at different degrees of warming. Some of the uncertainty is captured in the ranges shown, but there will be additional uncertainties about the exact size of impacts (more detail in Box 3.2). Temperatures represent increases relative to pre-industrial levels. At each temperature, the impacts are expressed for a 1°C band around the central temperature, e.g. 1°C represents the range 0.5 – 1.5°C etc. Numbers of people affected at different temperatures assume population and GDP scenarios for the 2080s from the Intergovernmental Panel on Climate Change (IPCC). Figures generally assume adaptation at the level of an individual or firm, but not economy-wide adaptations due to policy intervention (covered in Part V).*

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- Impact:
  - Water sources
  - Food production
  - Health
  - Environment
- Conclusion: strong and urgent global action to reduce greenhouse gases
  - Longer the inaction the greater the eventual cost and adjustment
  - Without action 5% of gdp a year rising to 20% of gdp
  - With action not drastic (1%), with opportunities, although competitive issues

# Solutions and actions

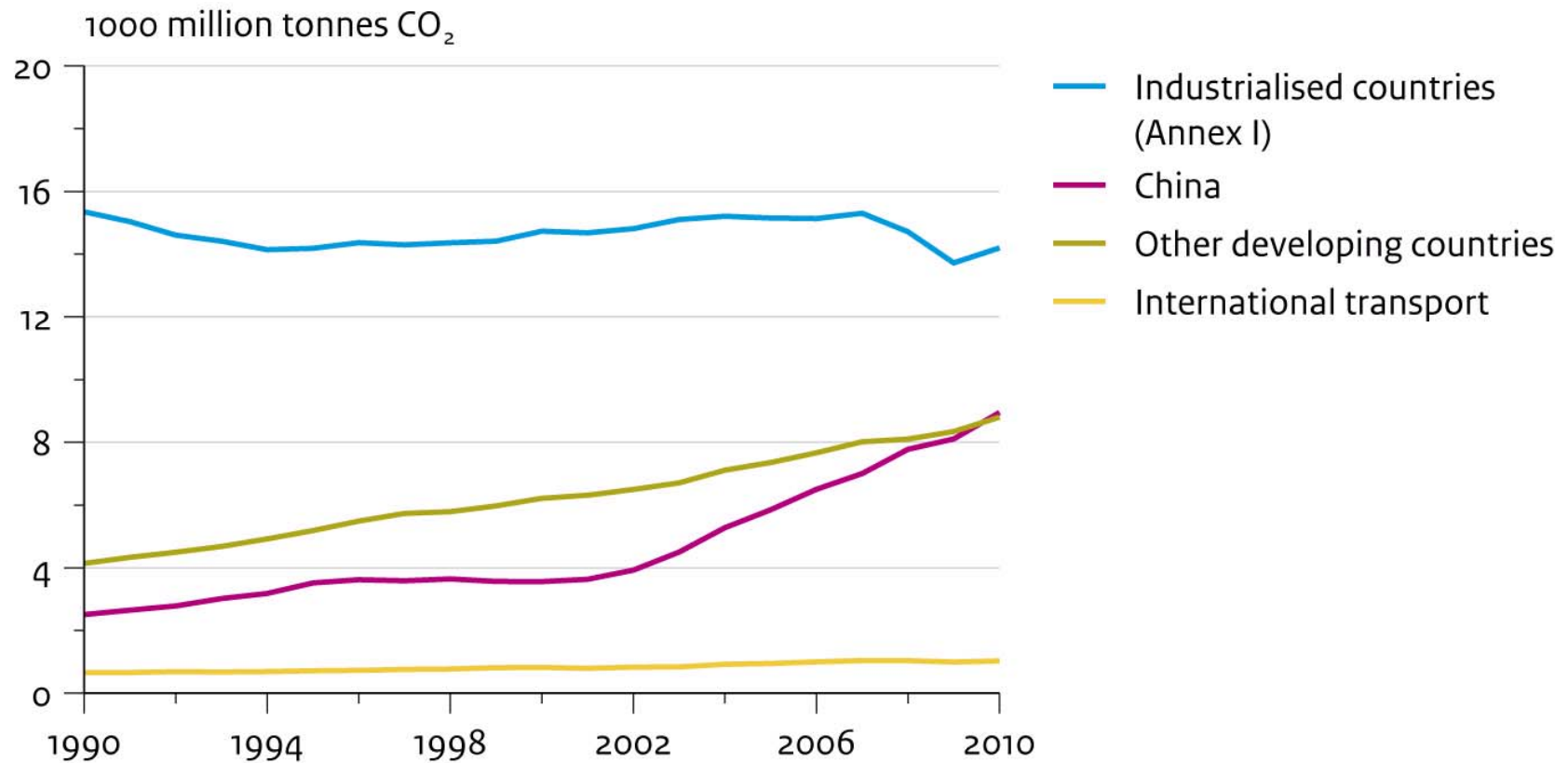
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## United Nations Framework Convention on Climate Change (UNFCCC) – Kyoto protocol 1997/2005

- Objective is to stabilise greenhouse gas concentrations at levels that do not affect the climate
- Annex 1 (developed) countries committed to cutting emissions by 5,2% from 1990 levels by 2012
- Some flexibility through
  - Emissions trading
  - Clean development mechanism (renewable energy, energy efficiency etc)
- Developing countries given some leeway given stage of development and need to address poverty + adaptation fund for climate change

# Total is still growing

## CO<sub>2</sub> emissions from fossil fuel use and cement production per region

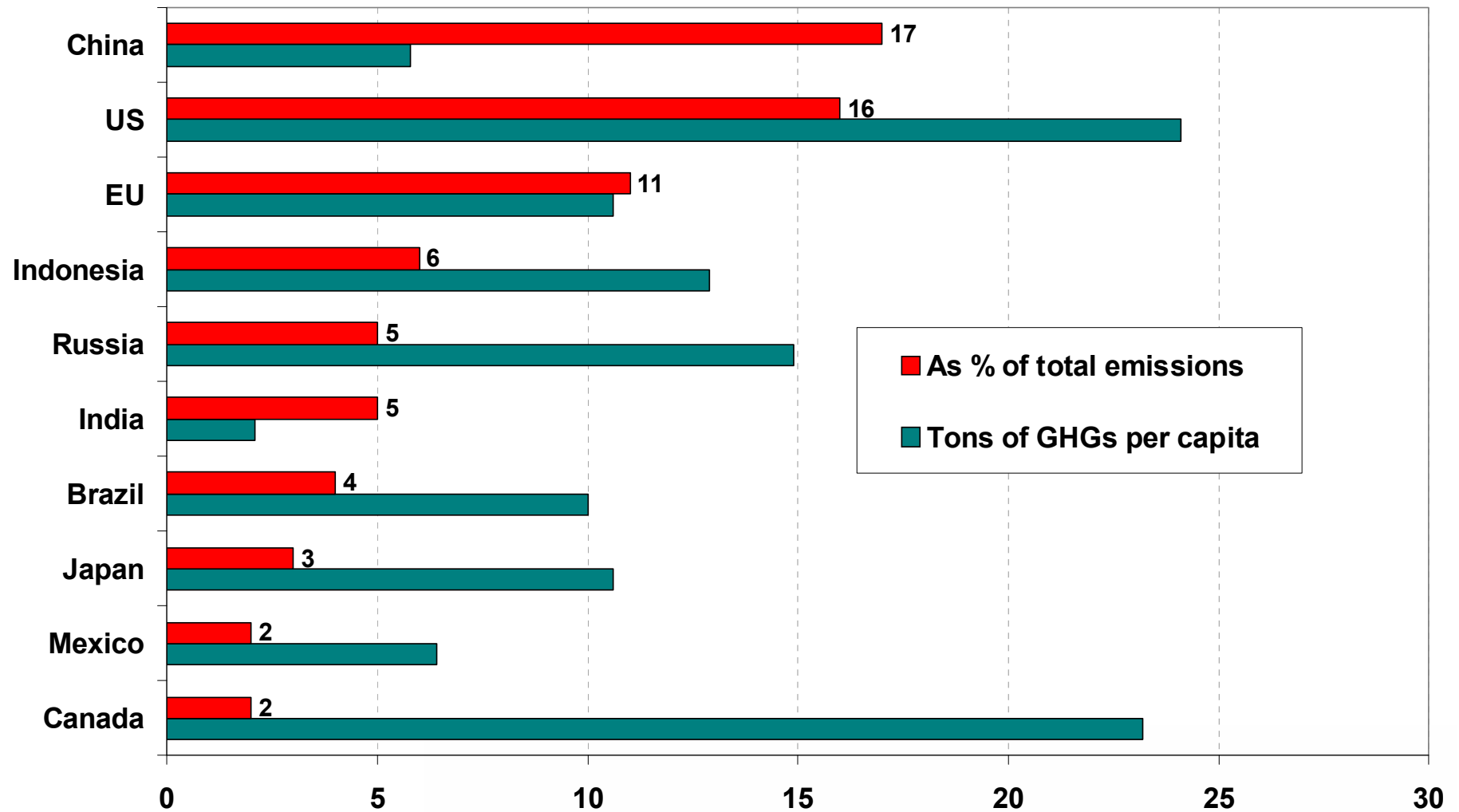


Source: EDGAR 4.2; Olivier et al., 2011.

[www.pbl.nl](http://www.pbl.nl)

# Main emitters

## Green house gas emission offenders - 2005



# Implications for South Africa

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## Dangers

- ❑ In an area where the effects of climate change will be severe
- ❑ South Africa is an offender because of large carbon based fuel reliance
- ❑ Trade tariffs may be used in retaliation on SA products if the necessary actions are not taken

## Opportunities

- ❑ New technologies could be a driver of growth
- ❑ Economy will have to restructure away from capital and energy-intensive growth in any case because of cost and capacity constraints