Climate Change and Health

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Public health benefits of strategies to reduce greenhouse gas emissions

The Task Force on Climate Change Mitigation and Public Health

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Supported by a consortium of funding bodies coordinated by the Wellcome Trust

Department of Health NIHR, Economic and Social Research Council, Royal College of Physicians, Academy of Medical Sciences, US National Institute of Environmental Health Sciences and WHO

Involving over 50 researchers from UK, USA, India, Canada, Australia, Spain, France, New Zealand, WHO Geneva

DH Department of Health

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LONDON SCHOOL OF HYGIENE & TROPICAL MEDICINE

NHS National Institute for Health Research

NIEHS National Institute of Environmental Health Sciences U.S. National Institutes of Health

Royal College of Physicians Setting higher medical standards

The Academy of Medical Sciences

THE LANCET

wellcome trust

World Health Organization

Scope

Case studies in four sectors responsible for large emissions of greenhouse gases (GHGs)

- Household energy
- Urban land transport
- Food and agriculture
- Electricity generation

Health effects of short-lived greenhouse pollutant emissions

Health Effects

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Comparisons

• Comparison of 2010 population with and without intervention: Household energy; food and agriculture

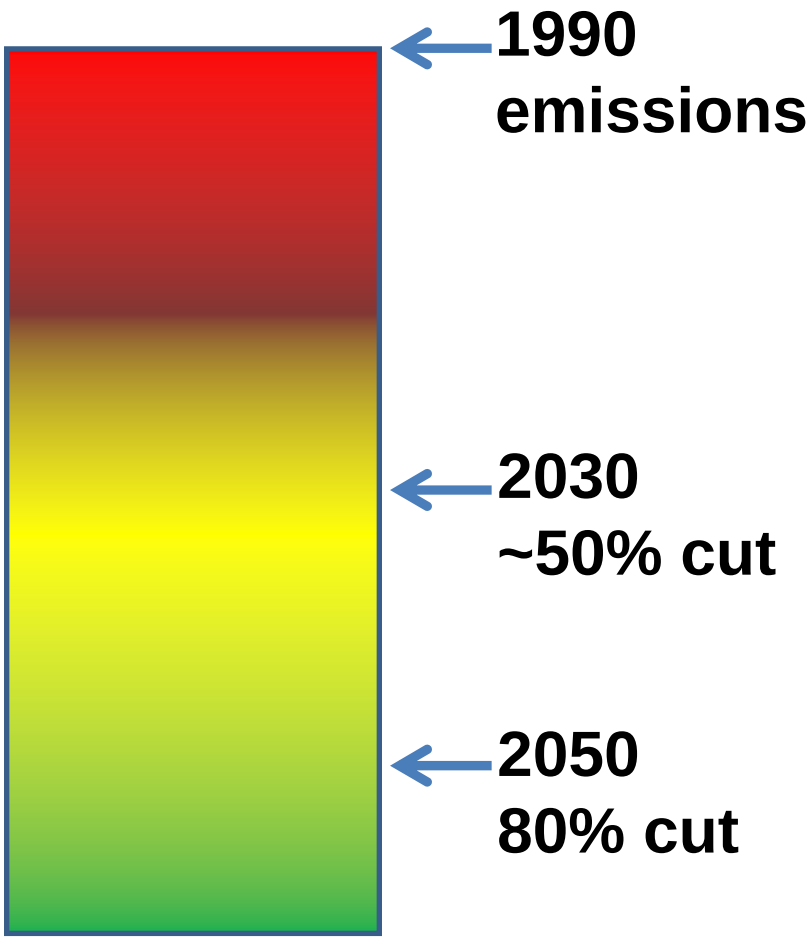
• Comparison of 2010 population but using exposures derived from 2030 projections (business-as-usual vs GHG reductions): Transport; electricity generation

Calculation

• Change in burdens of disease and premature deaths averted

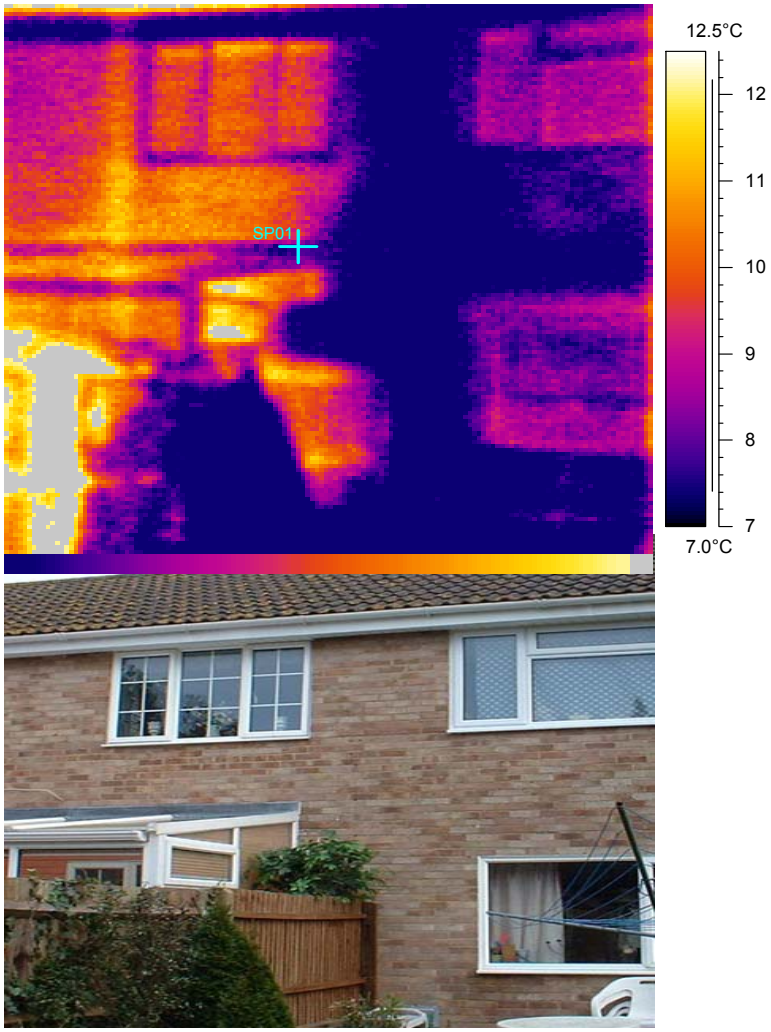
• Methods adapted from Comparative Risk Assessment approach (WHO)

Approach



- Focus on health effects in 2030 of GHG reductions consistent with 80% reduction in industrialised countries (50% global reduction) by 2050
- Mapping of pathways from GHG reduction (mitigation) strategies to health
- Case studies to illustrate health effects in 2010 population under different future scenarios in high and low income settings

Household Energy



UK Household Energy

Setting	Intervention	Time course	Principal exposures	Main outcomes
UK	Changes to: insulation, ventilation control, fuel source, temperature setting	2010, with and without intervention	Particles Radon Tobacco smoke Mould Temperature (cold)	Cardio-respiratory disease Lung cancer Cold-related death

Health and GHG Benefits (UK)

Impact in UK 2010 population in 1 year	UK household energy efficiency (combined improvements)
Premature deaths averted	~ 5400
Mt-CO_2 saved (vs 1990)	55

Household Energy in India

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Setting	Intervention	Time course	Principal exposures	Main outcomes
India	Improved (clean burning) cookstove programme	150 million stoves over 10 years	Indoor exposure to combustion products	Acute respiratory tract infection in children, Ischaemic Heart Disease, Chronic Obstructive Pulmonary Disease

Indian Stoves – Traditional and Modern

Traditional Biomass Stove

Per meal

~15x less black carbon and other particles

~10x less ozone precursors

~5x less carbon monoxide

Gasifier Stove with Electric Blower
(battery recharged with cell phone charger)

Health Benefits of the Indian Stove Programme

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	Deaths from ALRI	Deaths from COPD	Deaths from IHD
Avoided in 2020 (%)	30.2%	28.2%	5.8%
Total avoided 2010-20	240,000	1.27 million	560,000

ALRI=acute lower respiratory infections. COPD=chronic obstructive pulmonary disease. IHD=ischaemic heart disease.

GHG Benefits of the Indian Stove Programme

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- Reductions in black carbon, methane, ozone precursors could amount to the equivalent of 0.5-1.0 billion tonnes of CO_2 eq over the decade

- Cost <$50 per household every 5 years

Urban Transport Pathways Modelled: London and Delhi

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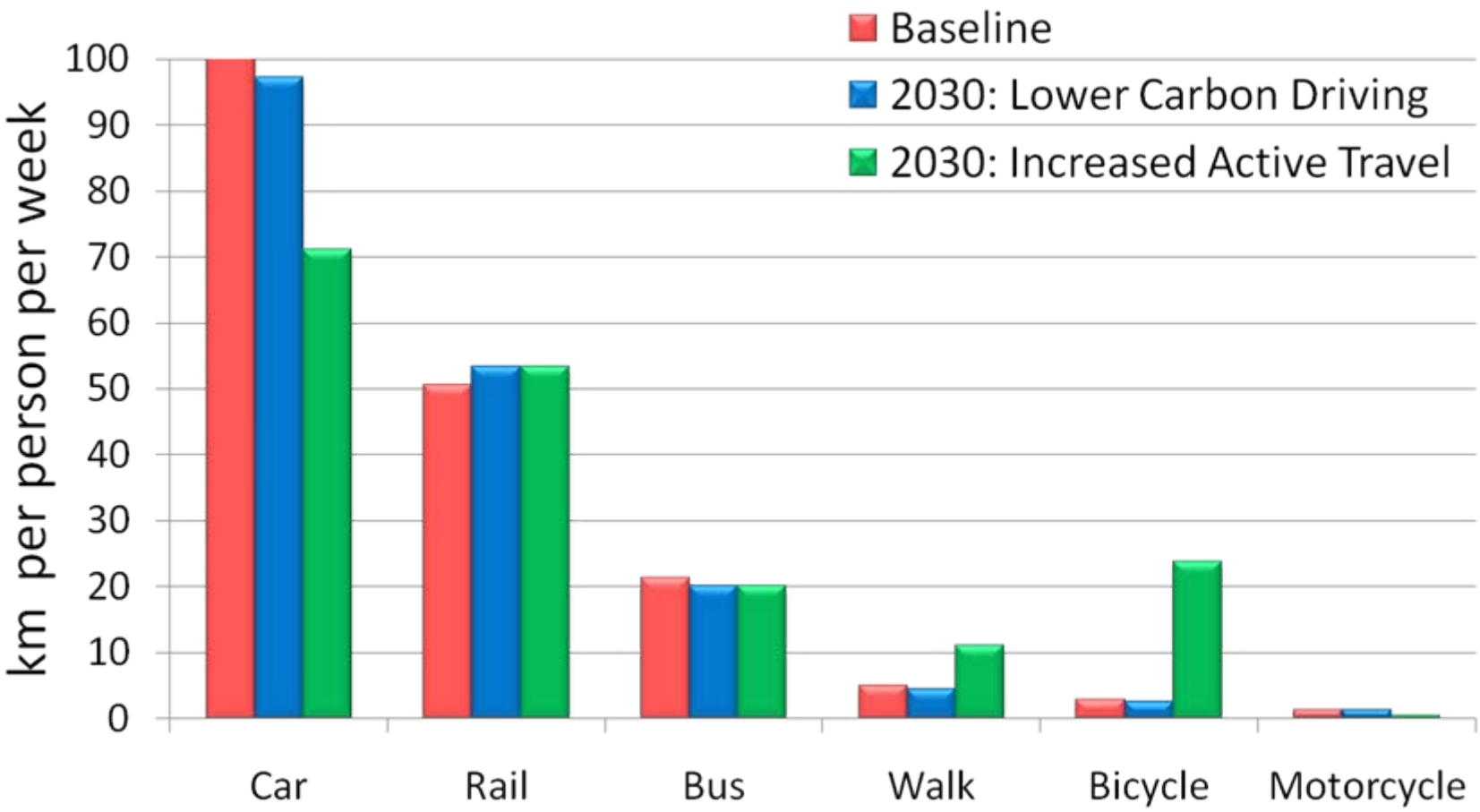
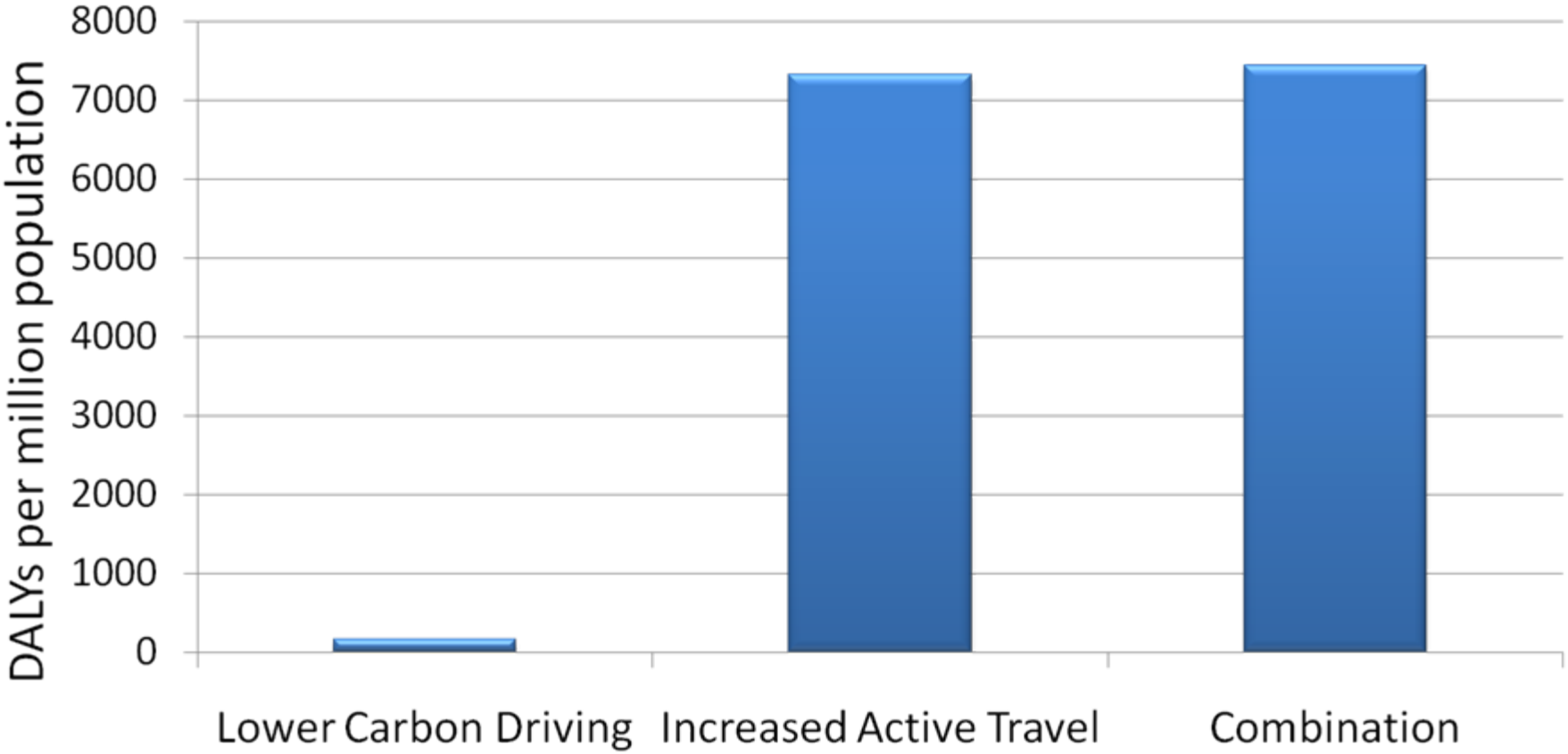
London Travel Patterns



Health Benefits in London: Alternative Scenarios



Health Effects by Disease (London)

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	Change in disease burden	Change in premature deaths
Ischaemic heart disease	10-19%	1950-4240
Cerebrovascular disease	10-18%	1190-2580
Dementia	7-8%	200-240
Breast cancer	12-13%	200-210
Road traffic crashes	19-39%	50-80

Health Effects by Disease (Delhi)

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	Change in disease burden	Change in premature deaths
Ischaemic heart disease	11-25%	2490-7140
Cerebrovascular disease	11-25%	1270-3650
Road traffic crashes	27-69%	1170-2990
Diabetes	6-17%	180-460
Depression	2-7%	NA

Electricity Generation: EU, India, China

2030 business as usual (**BAU**)

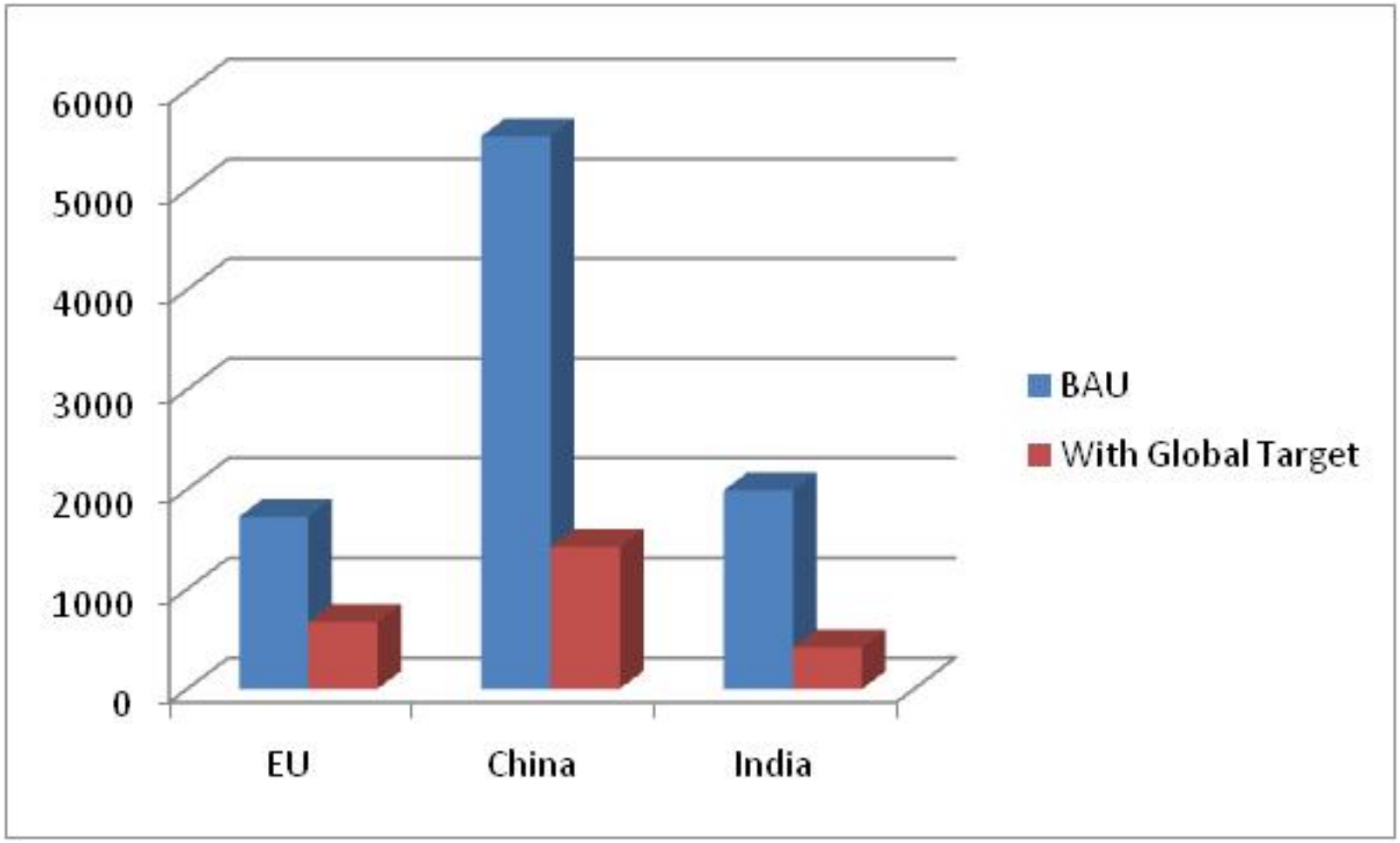
Vs

2030 with **global mitigation target**
(carbon trading)

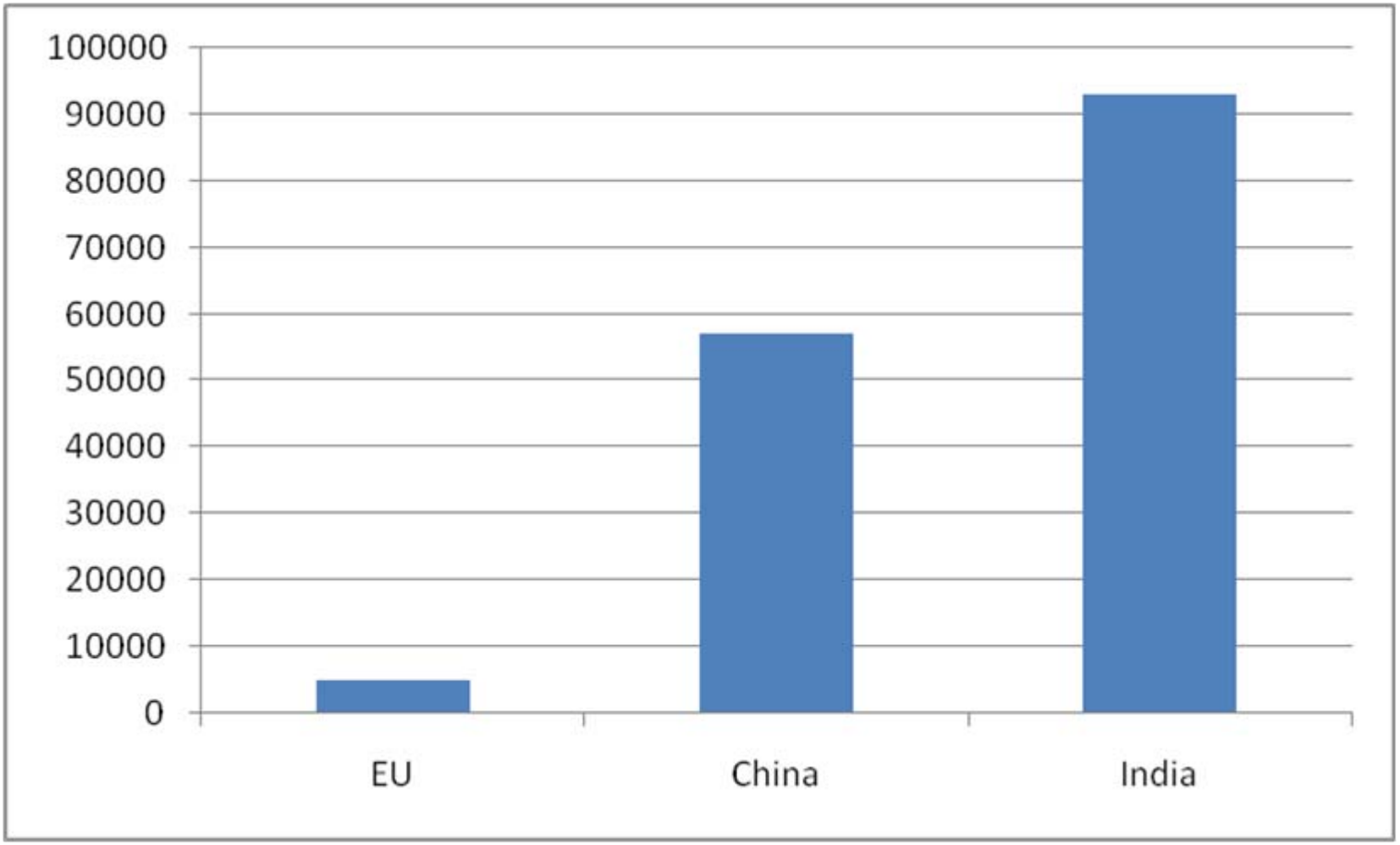
More renewables
More nuclear
Some coal with carbon capture and storage
Less coal otherwise

Comparison calculated: **Deaths** due to particulate air pollution from electricity generation, and **costs**.

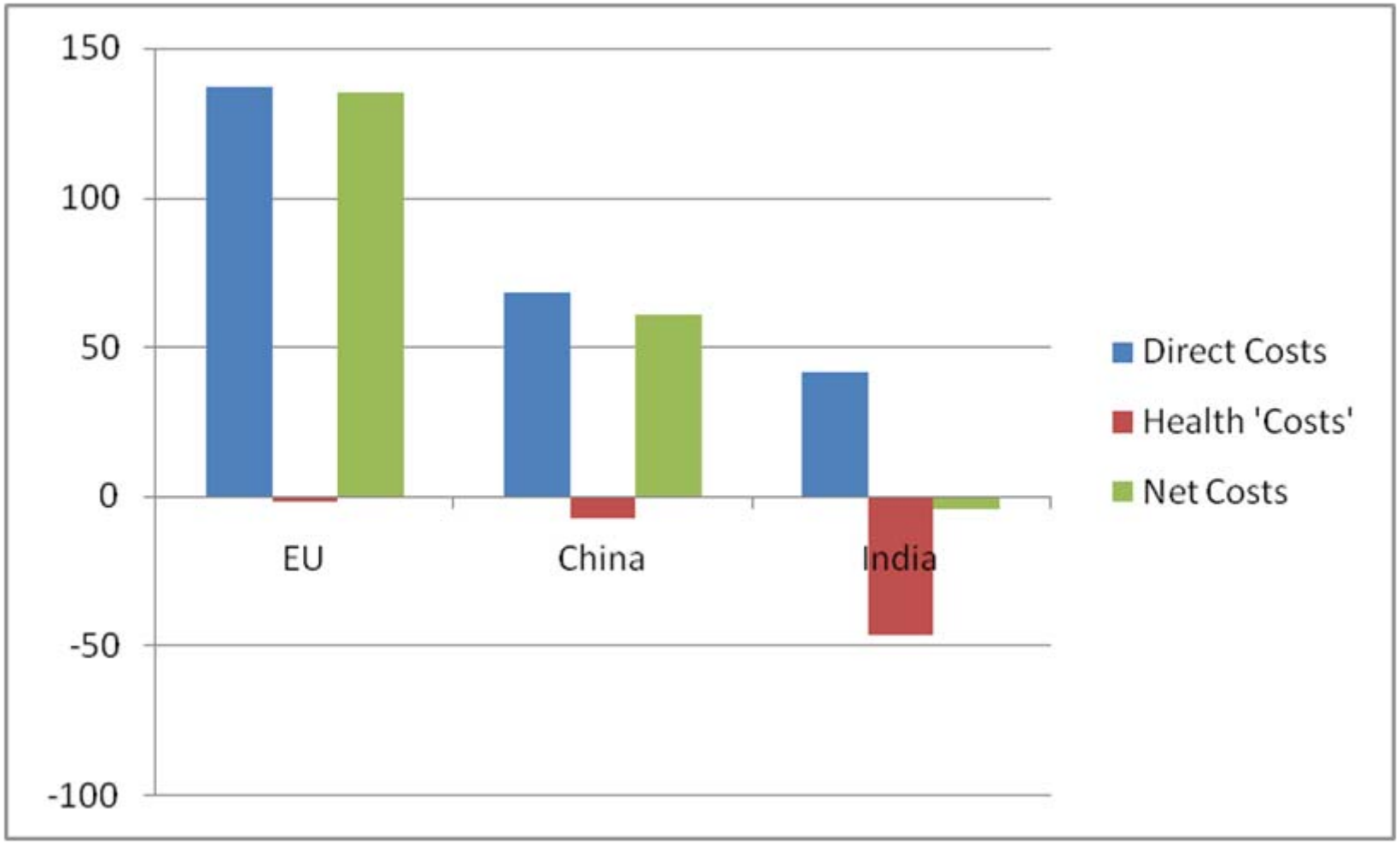
Reductions in emissions of CO2 from electricity in 2030 (full trade approach) in millions of tonnes



Premature Deaths Avoided in 2030



Costs of Mitigation US$/Tonne CO2



Food and Agriculture Sector

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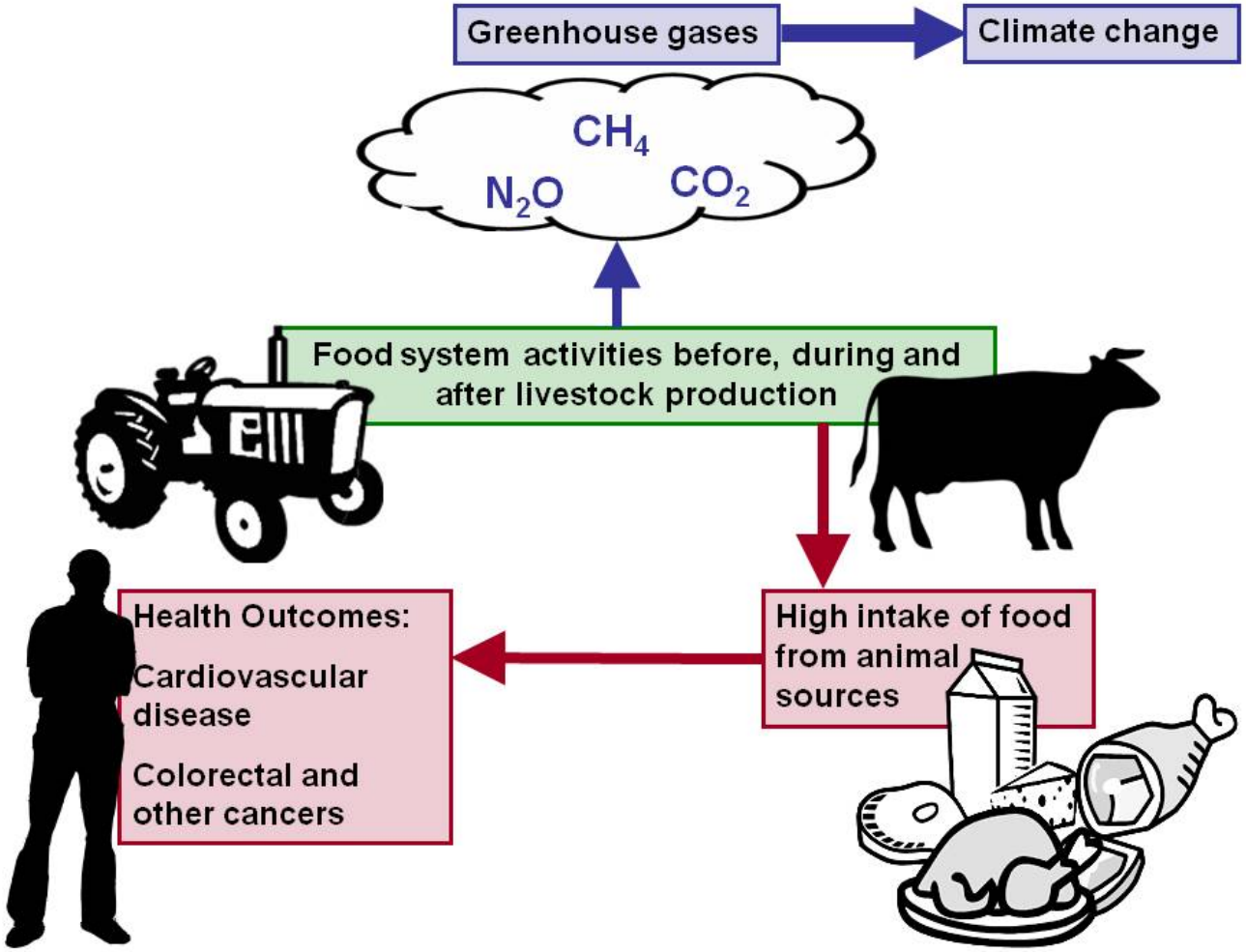
- Source of 10-12% of global greenhouse-gas emissions
- Change in land-use (eg. deforestation) significant contributor to global emissions (adds further 6-17%)
- Total emissions from sector set to rise by up to 50% by 2030
- Four-fifths (80%) of total emissions in sector arise from processes involved in livestock production

Pathways to Health



Strategies Modelled

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To meet UK target of 50% reduction in GHG emissions on 1990 levels by 2030 with focus on livestock sector

Assumed agricultural technological improvements

- necessary but not sufficient to meet target

Decrease overall livestock production

- estimated that a 30% cut in production, in addition to technological improvements would meet GHG target

Health Effects

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- Case studies: UK and the city of São Paulo, Brazil
- Assumed that 30% reduction in livestock production would decrease consumption of animal source saturated fat by 30%
- Estimated association of intake of animal source saturated fat with risk of ischaemic heart disease
- Substantial benefits from decreased burden of heart disease
  - UK: ~15%↓ (~ 18,000 premature deaths averted)
  - São Paulo: ~16%↓ (~ 1000 premature deaths averted)

Health Implications of Short-lived Greenhouse Pollutants – Paper #5

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- First comprehensive review of the health effects of three major climate-active pollutants: black carbon, ozone, and sulphates

- Includes first published study of the long-term health effects of black carbon – 66 US cities for 18 years

Short-lived GHPs and Health: Black Carbon and Ozone

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- Black carbon is damaging to health, perhaps more so than undifferentiated particles, but the evidence is equivocal even with this large study
- The study adds to the evidence that ozone causes excess mortality independently from other pollutants
- Control of black carbon and ozone would both reduce climate change and benefit population health.
- Because they are short lived (days), reductions in the emissions would immediately benefit climate, unlike CO2

Sulphates, Health and Climate Change

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- Sulphate particles seem more damaging to health than normal (undifferentiated) particles, in contrast to lab results
- Control of sulphates should continue worldwide because it provides significant benefits for health.
- Reducing sulphates will contribute to global warming by removing their cooling impact on the atmosphere.
- Insufficient evidence about the health effects of “geo-engineering” schemes to inject sulphate into the atmosphere for intentionally cooling the planet.

Action Points

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- Policy makers should take into account health co-benefits (and harms) when considering different options to reduce GHG emissions
- Research funders should support collaboration between health and other scientists to tackle climate change
- Health policy makers should encourage behavioural changes that improve health and meet climate goals
- Health professionals should advocate and educate to achieve benefits for health and climate based on the best research evidence

Conclusions

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The original UN Framework Convention seeks to protect the environment, economic development and human health.

The health gains associated with climate change mitigation policies have received little attention up to now and must feature more prominently in discussions at the forthcoming Climate Change conference in Copenhagen

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