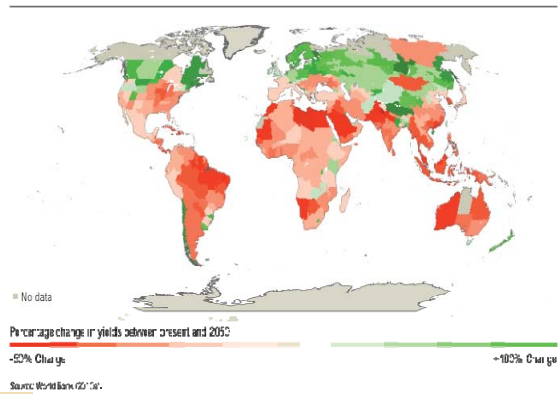
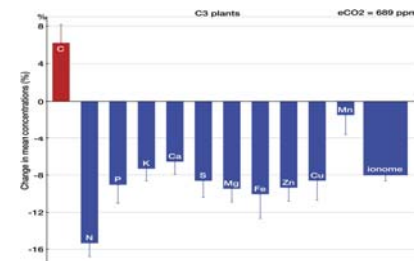


Figure 2 | Most studies now project adverse impacts on crop yields due to climate change (2°C warmer world)



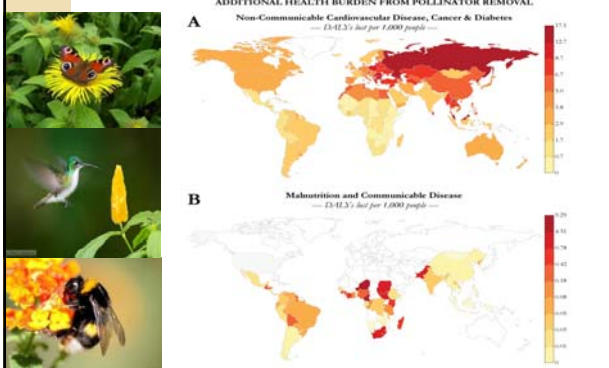
### Carbon dioxide fertilisation reduces nutrient concentration- meta analysis of 7761 observations

Loladze eLife 2014;3:e02245



<http://elifepublishing-cdn.s3.amazonaws.com/02245/elif02245-fig2-v3.jpg>

### Full pollinator service loss would lead to an estimated 1.42 million (1.38–1.48) additional deaths per year Smith, Myers et al Lancet 2015



### WATER STRESS BY COUNTRY

#### ratio of withdrawals to supply

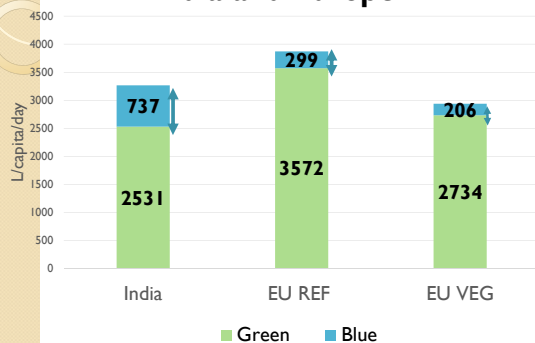
- Low stress (< 10%)
- Low to medium stress (10–20%)
- Medium to high stress (20–40%)
- High stress (40–80%)
- Extremely high stress (> 80%)

This map shows the average exposure of water users in each country to water stress, the ratio of total withdrawals to total renewable supply in a given area. A higher percentage means more water users are competing for limited supplies. Source: WRI Aqueduct, Gassett et al. 2013

AQUEDUCT

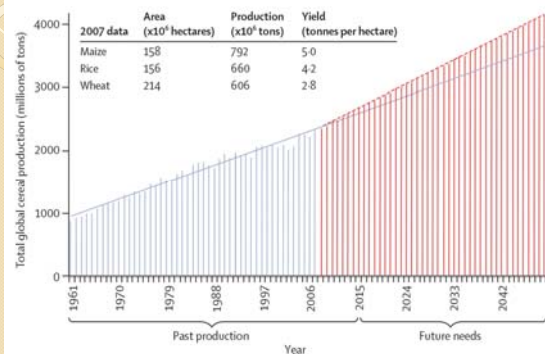
WORLD RESOURCES INSTITUTE

### Water footprint of diets in India and Europe

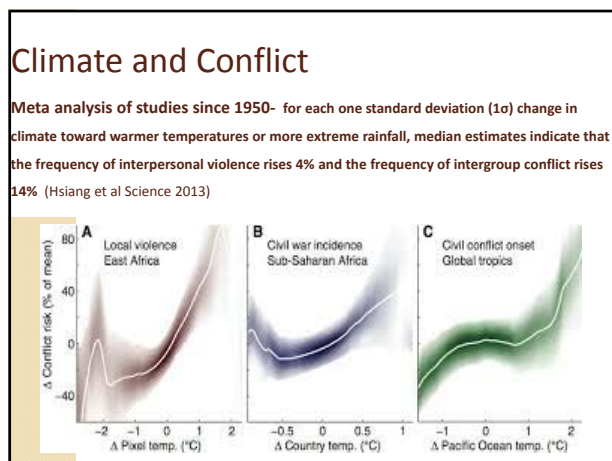
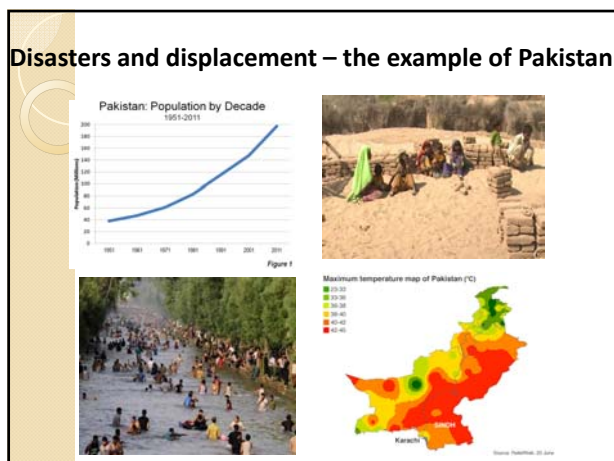
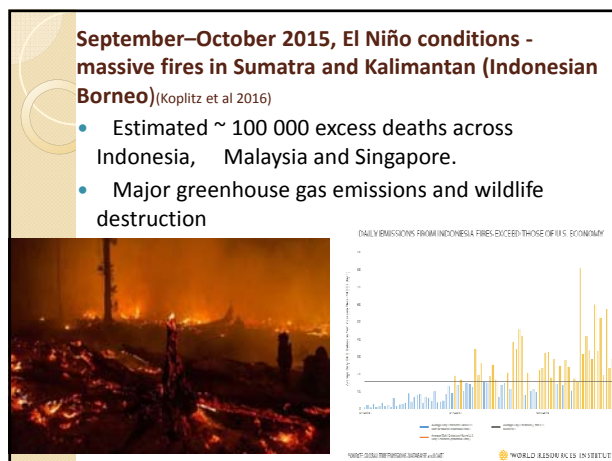
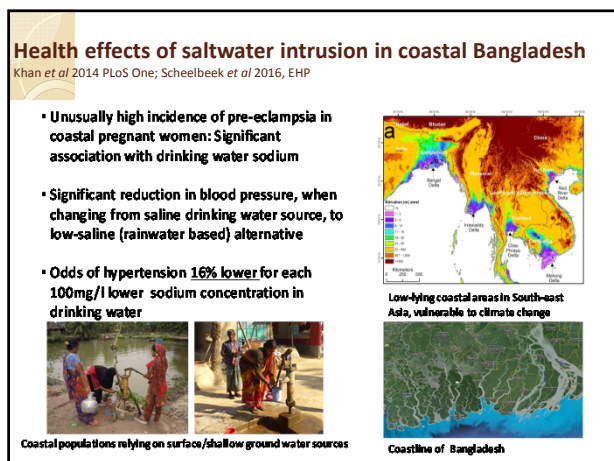
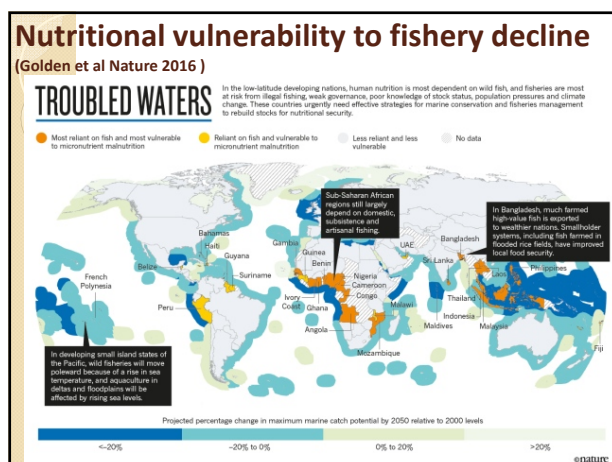
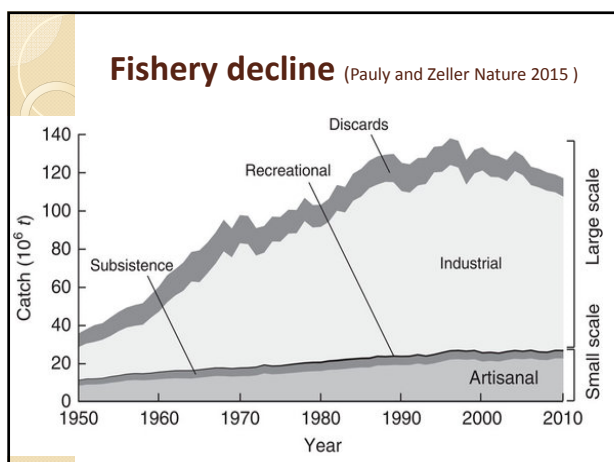


Harris et al., 2017, Vanham et al., 2013

### The challenges of meeting increased food requirements



Tester and Langridge (2010)





Record drought in Syria – risk more than doubled by climate change

### Timeline of Events

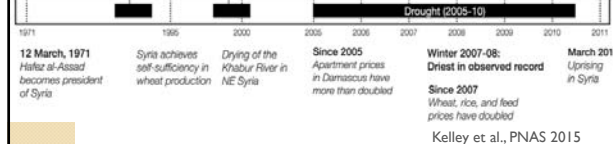
Prior to the 2011 Uprising

1970s-1990s

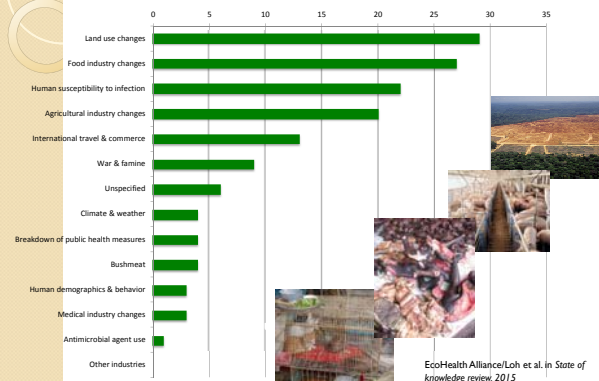
Agricultural policies promote production of staple crops, leading to increase in number of groundwater wells and use of inefficient and outdated irrigation methods

Drought (1988-1993)

Drought (1998-2000)



### Drivers of recently-emerging infectious diseases in humans from wildlife



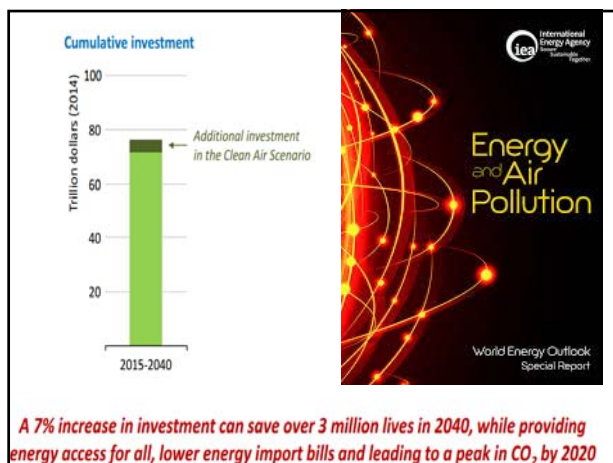
### Meeting the challenges – Imagination, Knowledge, Implementation



### Health co-benefits from the 'low-carbon' economy (Haines et al 2009)

Through policies in several sectors e.g.

- Housing
- Transport
- Food and agriculture
- Electricity generation



### Health Economic Benefits of reducing air pollution through low carbon policies

Marginal benefits of avoided mortality \$50-380/tCO<sub>2</sub> - exceed abatement costs (West et al Nature Climate Change 2014)



Addressing coal combustion is a priority

### Reducing black carbon emissions could prevent 2.4 million (0.7-4.6m) premature deaths annually especially in Asia (UNEP2011)



Improved biomass stoves



Modern coke ovens



Remove big smokers / DPF



Cooking with clean fuel

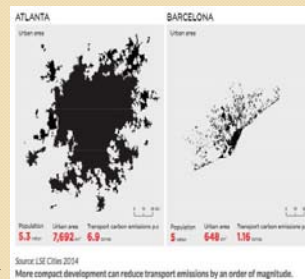


Improved brick kilns

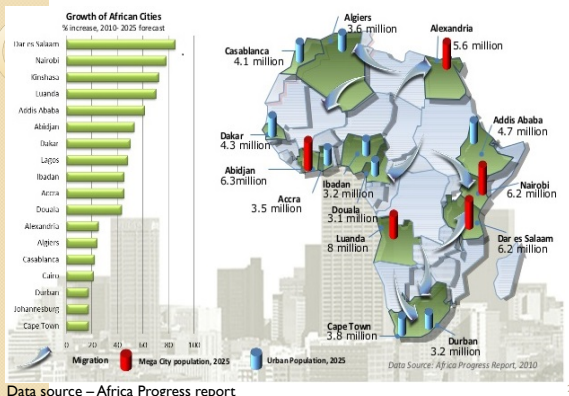
### The Future of Planetary health will depend on cities

Cities are engines of economic growth and social change, with annual economic activity of about US\$62 trillion, 85% of global GDP in 2015 and 71–76% of global energy-related greenhouse gas (GHG) emissions.

Newclimateeconomy/report/workingpaper\_cities\_final\_web.pdf 2015

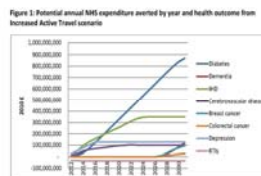


### Urbanization and its effects in Africa

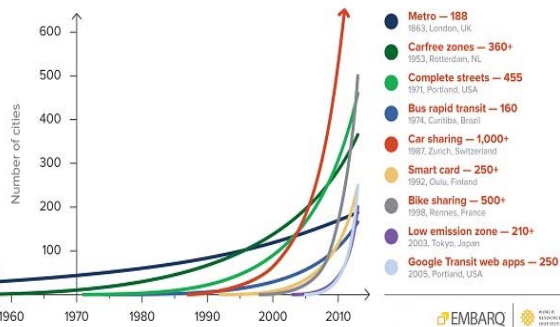


### Health co-benefits of increased active travel and low carbon transport (London, Delhi, São Paulo)

(Woodcock et al 2009, Jarrett et al 2012, de Sa et al submitted)

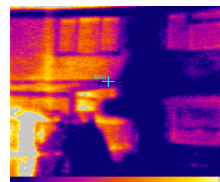


### Sustainable mobility trends scale up



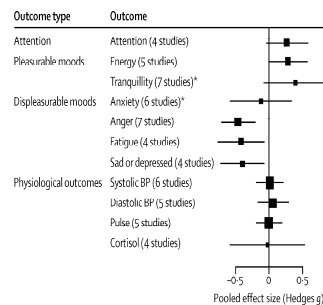
### Benefits of low carbon and energy efficient housing the UK (combined insulation and ventilation control improvements)

(Wilkinson et al 2009)



Impacts	Reduced exposures e.g. to fine particles, radon, cold, mould, tobacco smoke
Premature deaths averted	~ 5400/ year
Mt-CO <sub>2</sub> saved (vs 1990)	55

### Psychological and emotional outcomes from exposure to natural versus synthetic environments



### What could cities do for Planetary Health?

Accessible efficient public transport and active travel



Universal access to clean low carbon energy



Safe access to green spaces and ecosystem strategies for resilience



Housing Improvements Water and Sanitation



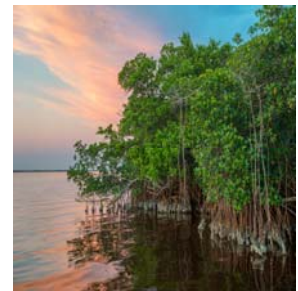
### How Forest Conservation Reduces Disease risks – examples from the Brazilian Amazon



- Decreased Malaria transmission
- Reduced air pollution and fewer Acute Respiratory Infections (ARI)
- Cleaner water--- Less diarrhoeal disease –

Bauch, Birkenbach, Pattanayak and Sills PNAS 2014

### Ecosystem strategies can increase disaster resilience e.g. wetlands, mangroves and coral reefs can protect coastlines

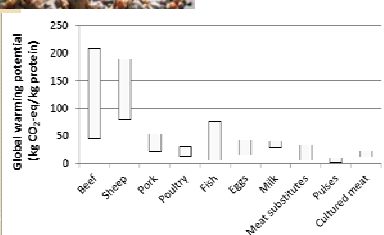


### Addressing unsustainable food systems



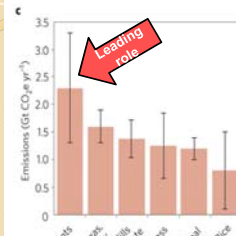
Nearly 30% of the world's total agricultural land is used to produce food that is never eaten.

We are using grains to feed animals !

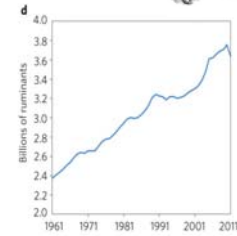


Tuomisto et al. (2014)

### Ruminants are a large part of the methane story



Estimated annual anthropogenic emissions from major sources of methane in recent years.



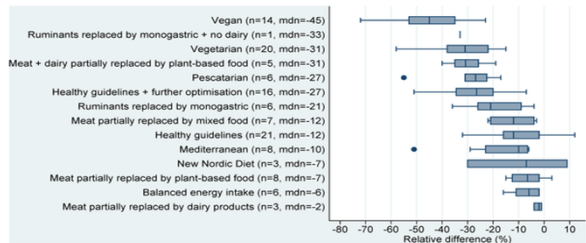
Global ruminant numbers from 1961 to 2011.

Ripple WJ et al. Ruminants, climate change and climate policy. *Nature Climate Change* 2014;4:2-5



## Greenhouse gas emissions from diets

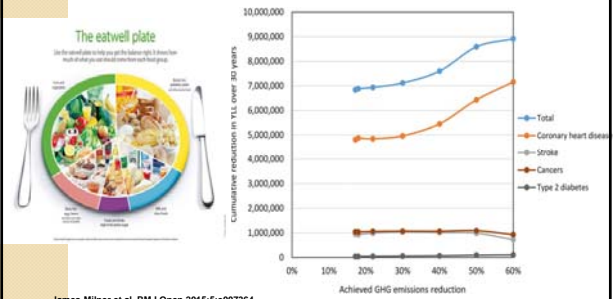
Fig 2. Relative differences in GHG emissions (kg CO<sub>2</sub>e/capita/year) between current average diets and sustainable dietary patterns.



Aleksandrowicz L, Green R, Joy EJM, Smith P, Haines A (2016) The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review PLoS ONE 11(11): e0165797. doi:10.1371/journal.pone.0165797  
<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0165797>

PLOS ONE

## Modelled health impacts associated with dietary changes in the UK for different levels of greenhouse gas (GHG) reduction.

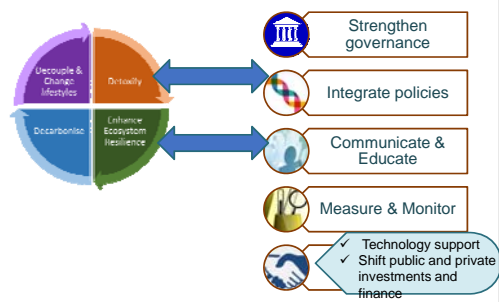


James Milner et al. BMJ Open 2015;5:e007364

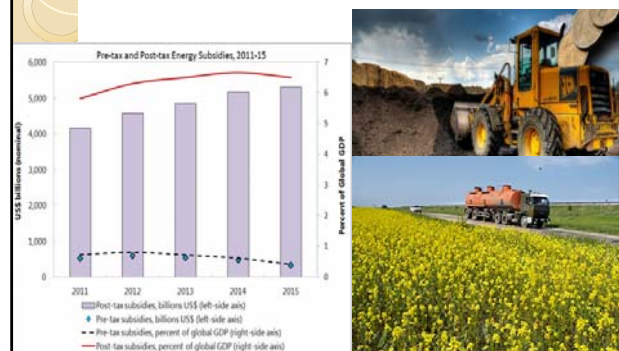
©2015 by British Medical Journal Publishing Group

BMJ Open

## Overcoming barriers to change through economy wide strategies



## Taxes and subsidies that support planetary health

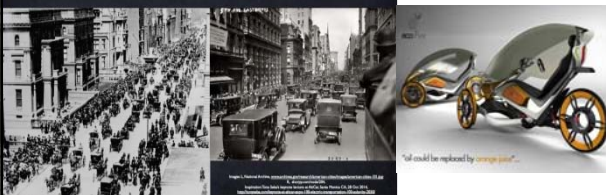


## Disruptive Change

Easter Parade on Fifth Avenue, New York, 13 years apart

1900: where's the car?

1913: where's the horse?



Source: Campanale, Carbontracker

Fabian Magri, Argentina

## Towards an environmentally sustainable health system

- Reduce energy use, GHG emissions and environmental footprint.
- Increase resilience to floods, heatwaves and disease outbreaks
- Provide care closer to home
- Reduce health care vehicle emissions and encourage use of public transportation and bicycles
- Promote healthy low impact diets



- 'Solutions lie within reach and should be based on the redefinition of prosperity to focus on the enhancement of quality of life and delivery of improved health for all, together with respect for the integrity of natural systems'

Rockefeller/ Lancet Commission on Planetary health 2015

