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Food waste, sustainable diets and climate change

Coherent solutions in the long view.

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Centre for Food Policy
Shaping an effective food system

Who am I? – Christian Reynolds

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wrap · STFC Food Network+ · N8 AgriFood · The Nutrition Society – Advancing Nutritional Science

University of South Australia · University of Aberdeen · The University Of Sheffield. Institute for Sustainable Food. · UK Data Service

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Focus: healthy sustainable diets and food consumption (including waste)

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Review

Review: Consumption-stage food waste reduction interventions – What works and how to design better interventions

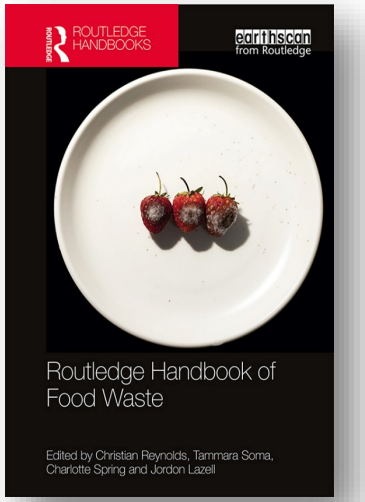
Christian Reynolds[a,b,*], Liam Goucher[c], Tom Quested[b], Sarah Bromley[b], Sam Gillick[b], Victoria K. Wells[d], David Evans[e], Lenny Koh[c], Annika Carlsson Kanyama[f], Cecilia Katzeff[g], Åsa Svenfelt[f], Peter Jackson[a]

Public Health Nutrition: 22(8), 1503–1517 doi:10.1017/S1368980018003774

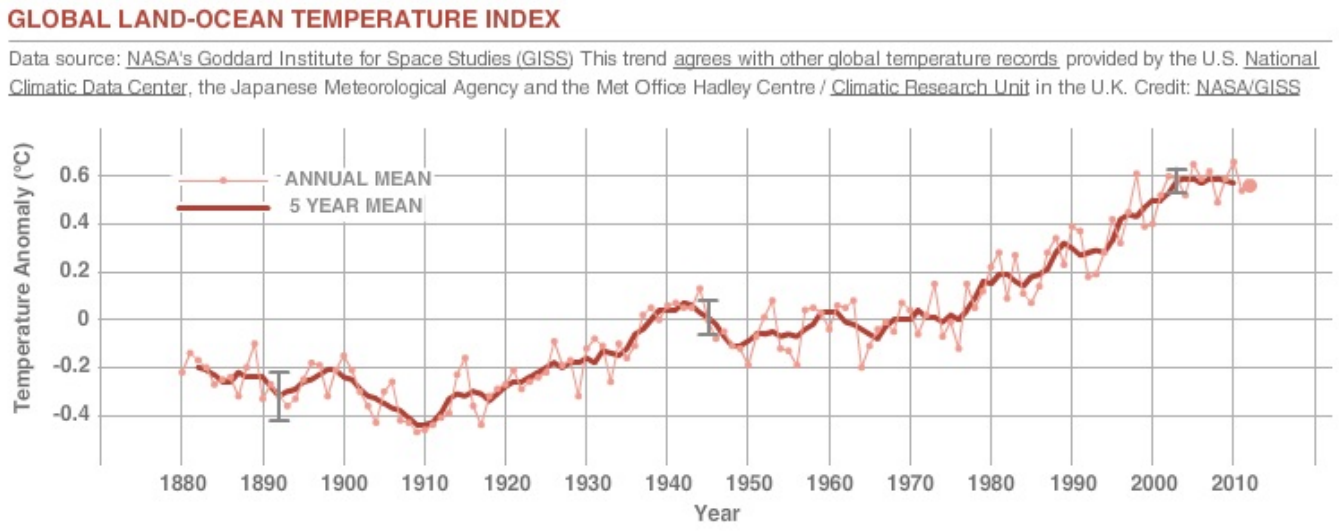
Healthy and sustainable diets that meet greenhouse gas emission reduction targets and are affordable for different income groups in the UK

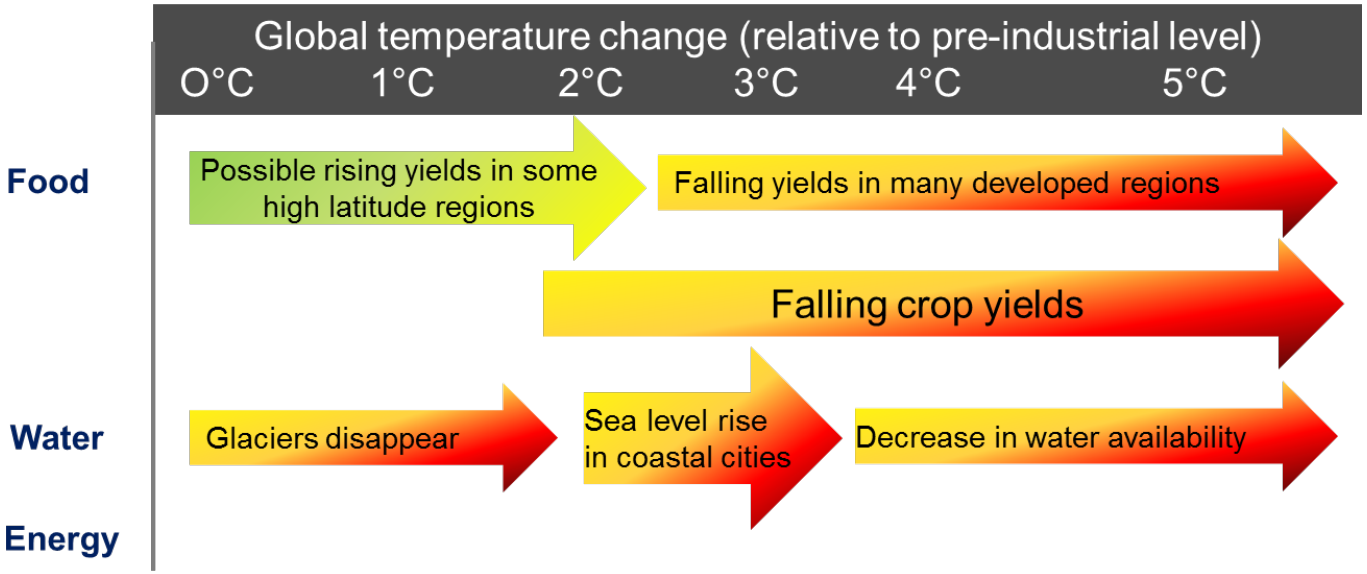
Christian J Reynolds[1], Graham W Horgan[2], Stephen Whybrow[1] and Jennie I Macdiarmid[1,*]

[1]The Rowett Institute University of Aberdeen, Aberdeen AB25 2ZD, UK: [2]Biomathematics & Statistics Scotland, Aberdeen, UK



The climate is changing…



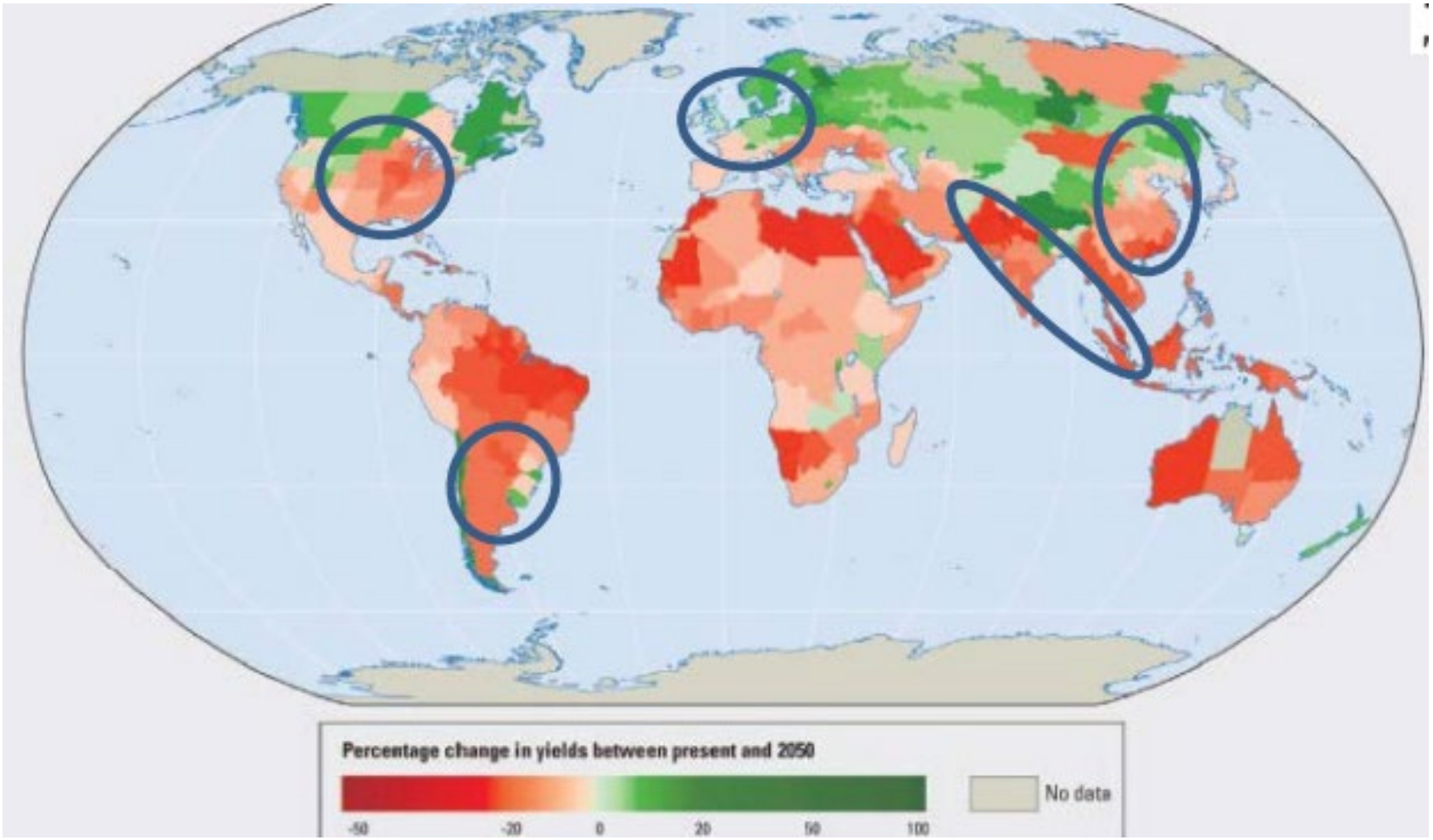


French winemakers count cost of 'worst frost in decades'

Government prepares rescue package as rare freezing temperatures damage crops and vines

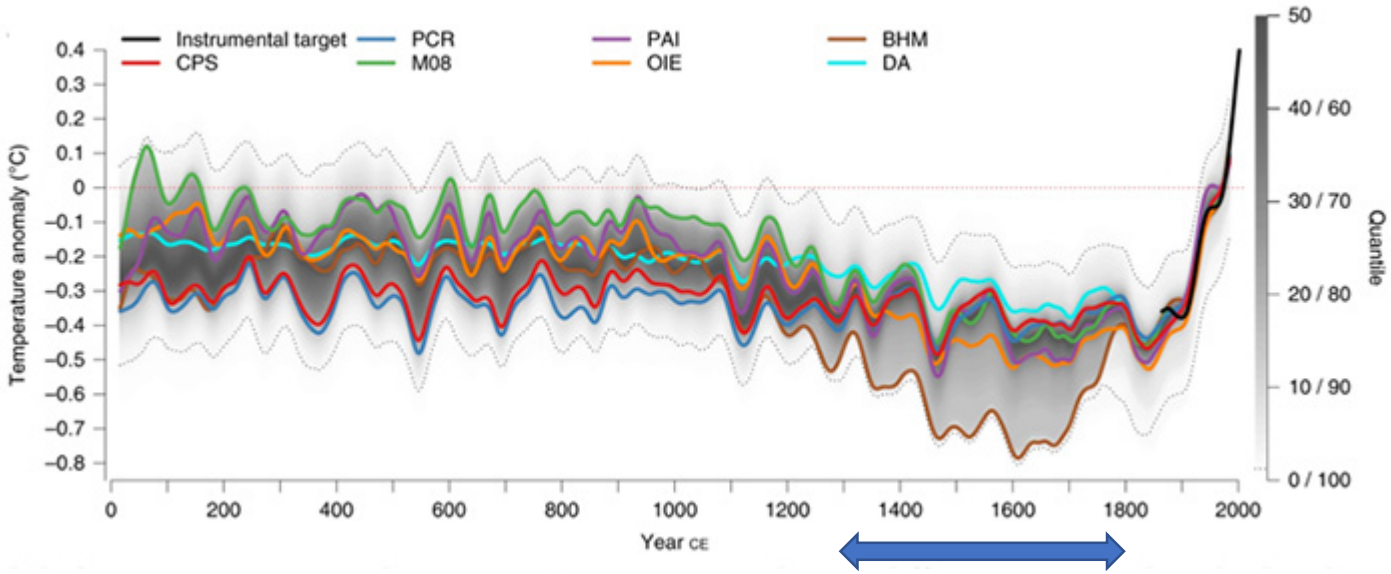
▲ Burgundy vines have been set alight to fight against frost. Photograph: Etienne Ramousse/Zeppelin/Sipa/Rex/Shutterstock

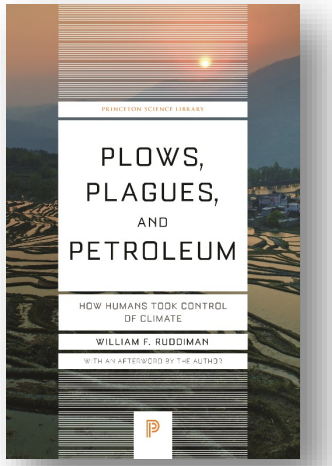
Food production and climatic change are linked



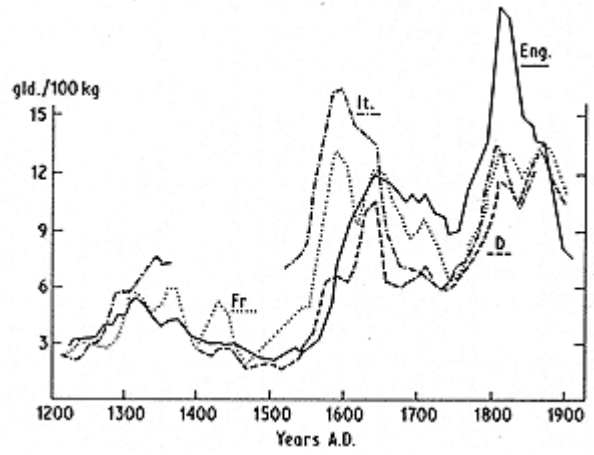
Wheeler, Tim, and Joachim Von Braun. "Climate change impacts on global food security." *Science* 341.6145 (2013): 508-513.

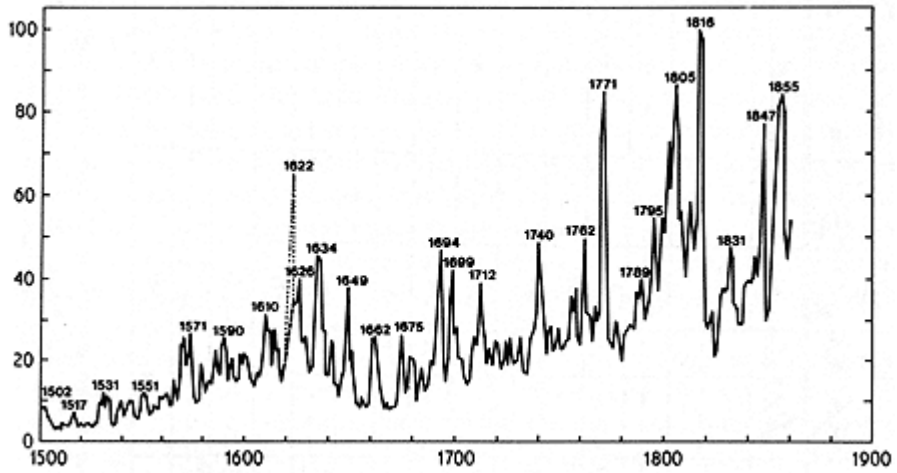
Food and climate have always been linked!

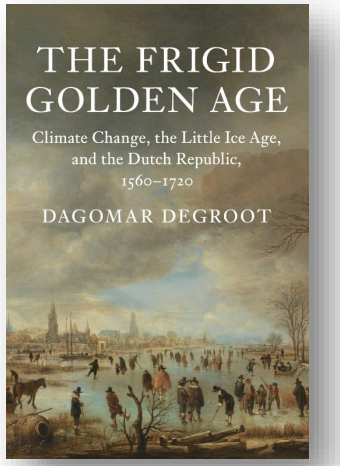




Global temperatures over the past 2,000 years, according to different statistical methods. The black line represents modern warming, as measured by meteorological instruments. Global cooling in even the chilliest decades probably did not exceed 0.5 degrees Celsius. https://aeon.co/essays/the-little-ice-age-is-a-history-of-resilience-and-surprises



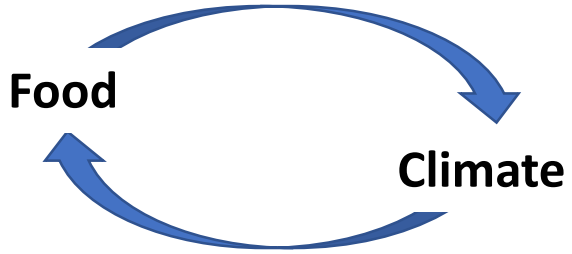




Prices of **wheat** expressed in Dutch guilders per 100 kg. in various countries vs. time. Price of **rye** in Germany vs. time expressed as an index.(Source: Lamb, 1995) https://www.sunysuffolk.edu/explore-academics/faculty-and-staff/faculty-websites/scott-mandia/lia/little_ice_age.html

Feedback loops of food and climate change

Food production and consumption impacts upon **climate**



Climate impacts upon **food** production and consumption

- The "little ice age" of 1500-1700, or “age of extremes” of 1310s-1810s, changed what Europeans (etc.) farmed, ate, cooked, modes of production, consumption etc.
- Created resilient societies. (Lots of war, famine etc. !)
- Led to the start of the current European (and global) dietary patterns, and food regimes.

These (cool) food systems, crops, modes of production, and diets are foundational for the modern food system.

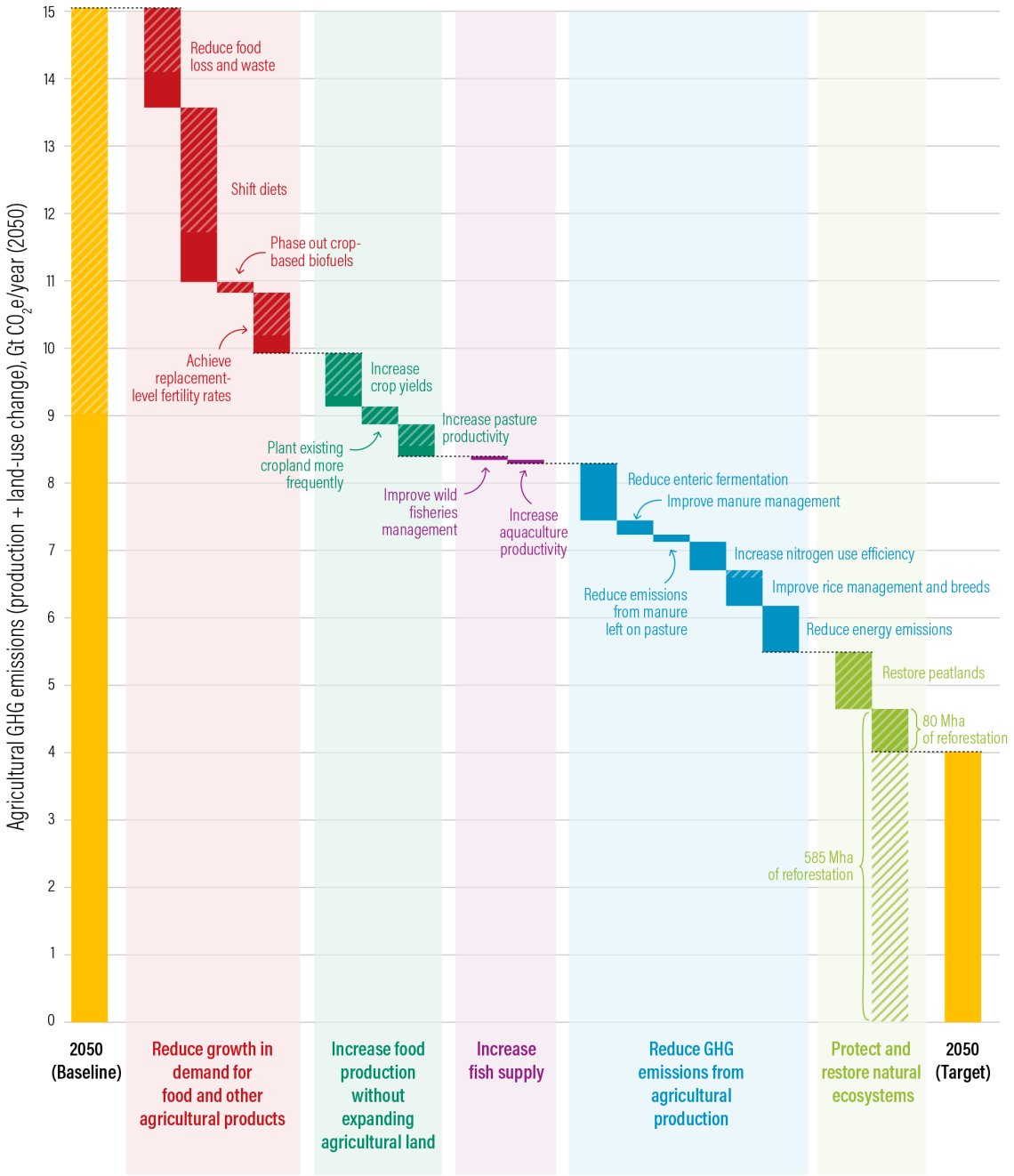
Probably only ever a max 0.5°C cooling!

The emissions reduction challenge – A warming food system

The two biggest reductions we can make to agricultural GHGE to achieve a **2°C** warming target (4 Gt/year) or **1.5°C** warming target (0 Gt/year) are through:

1. **Reducing Food Loss and Waste**
2. **Shifting to sustainable diets**

The rest of this talk will be focusing on these two interconnected actions, and how we can use **coherence** between solutions to help.

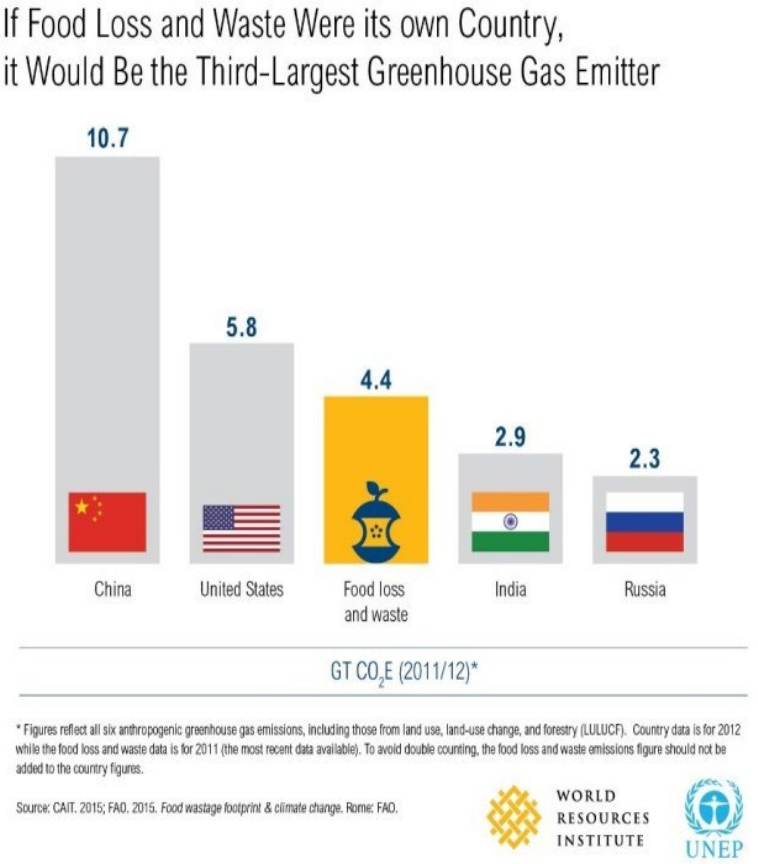


Note: Solid areas represent agricultural production emissions. Hatched areas represent emissions from land-use change.
Source: GlobAgri-WRR model.

Source WRI, [World Resources Report: Creating a Sustainable Food Future]

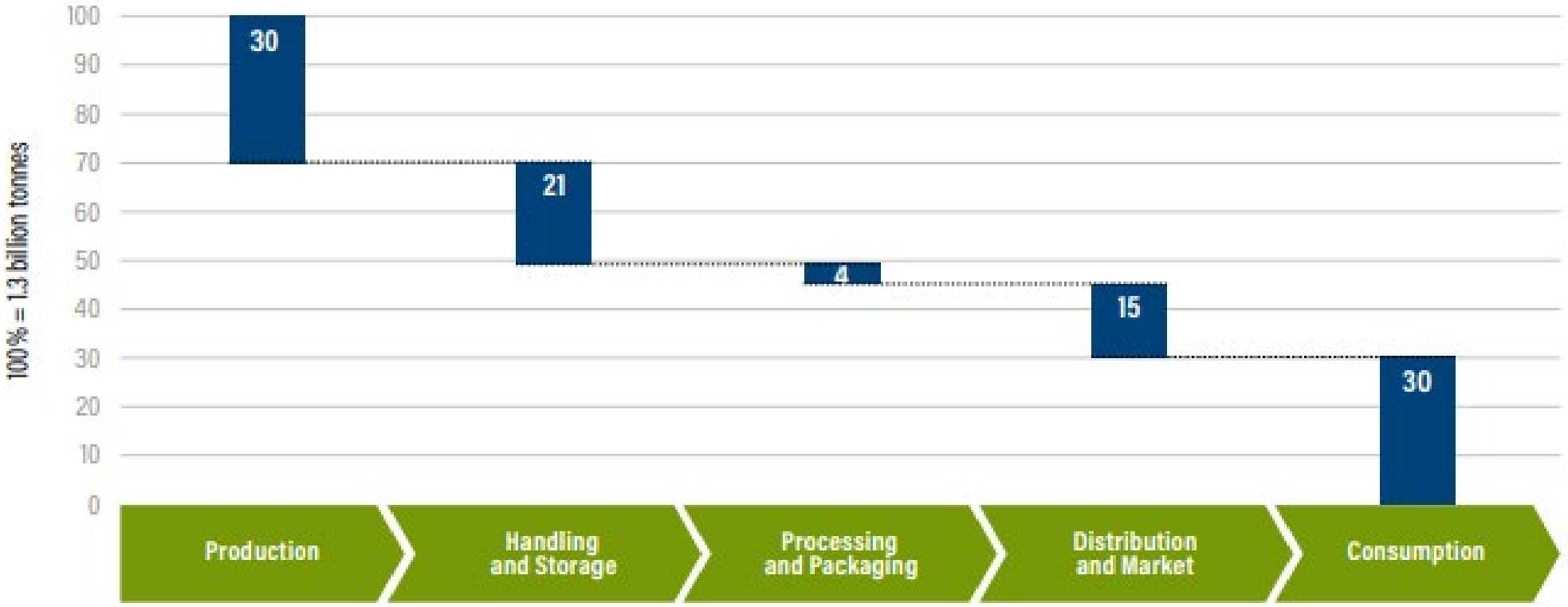
Food Loss and Waste (FLW)

Note: One-quarter of food emissions comes from food that is never eaten: 15% of food emissions from food lost in supply chains; and 9% from consumer waste.
Data source: Joseph Poore & Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science*.
OurWorldinData.org – Research and data to make progress against the world's largest problems. Licensed under CC-BY by the author Hannah Ritchie.



FLW Spread across the supply chain

Figure 1.7 | Distribution of Total Global Food Loss and Waste across the Food Supply Chain (2007)

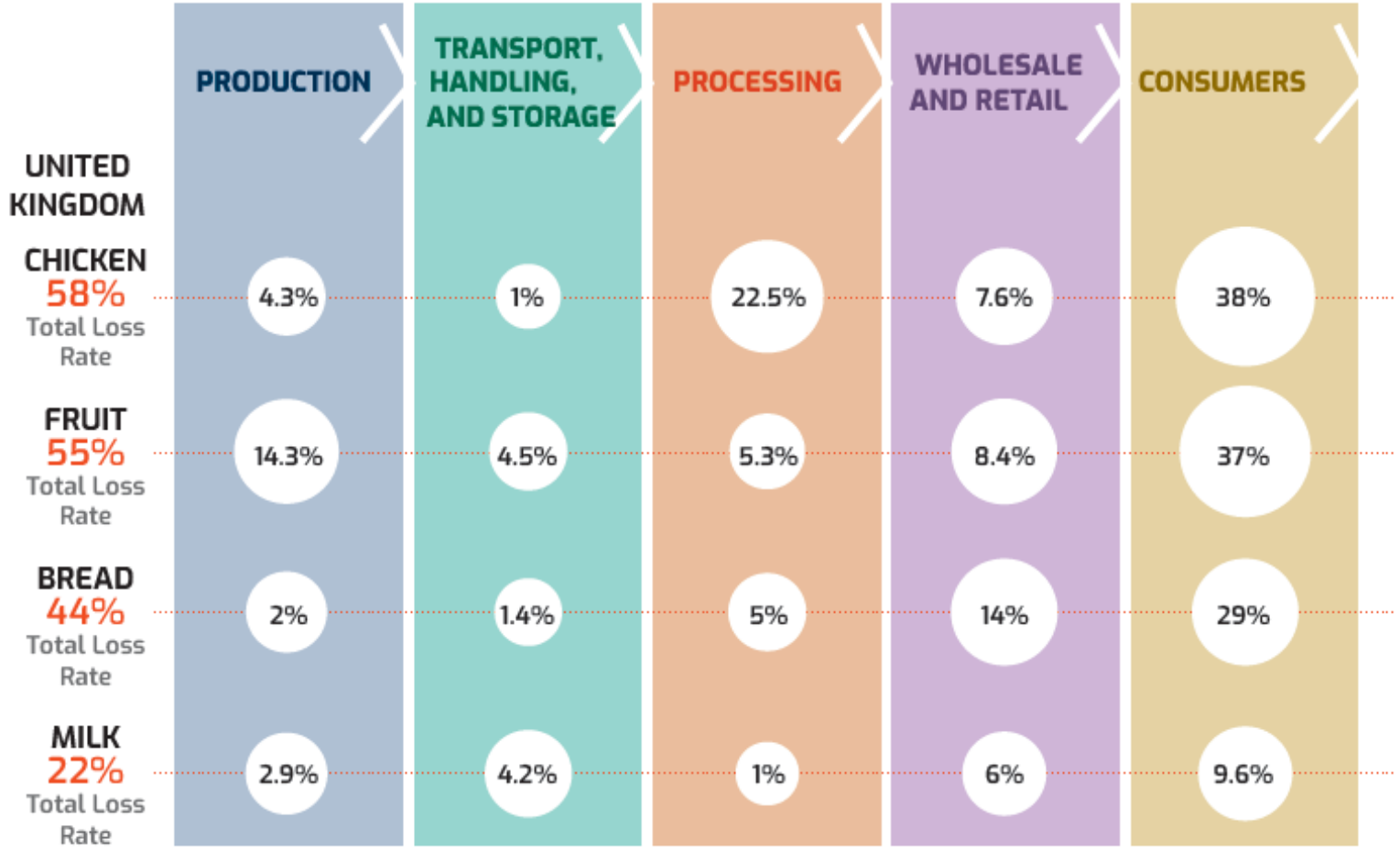


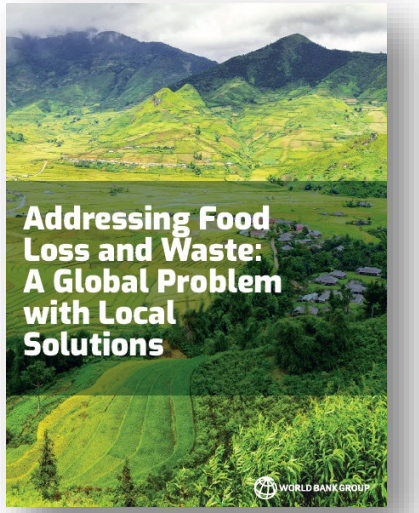
Source: WRI analysis based on FAO (2011).

Source: WRI, REDUCING FOOD LOSS AND WASTE Setting a Global Action Agenda https://wriorg.s3.amazonaws.com/s3fs-public/reducing-food-loss-waste-global-action-agenda_1.pdf

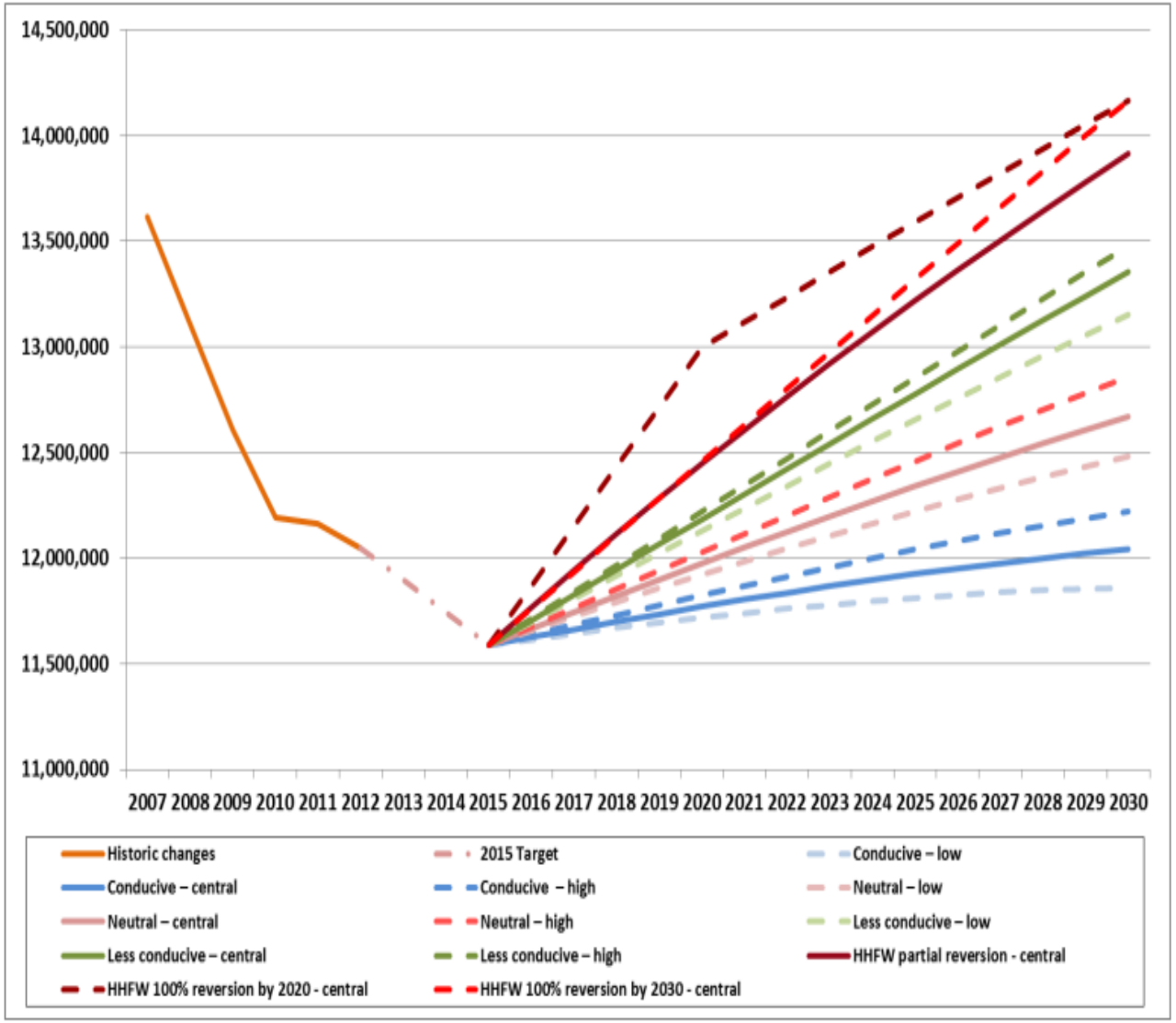
Action needed at different points in the supply chain, for diff. products/countries…

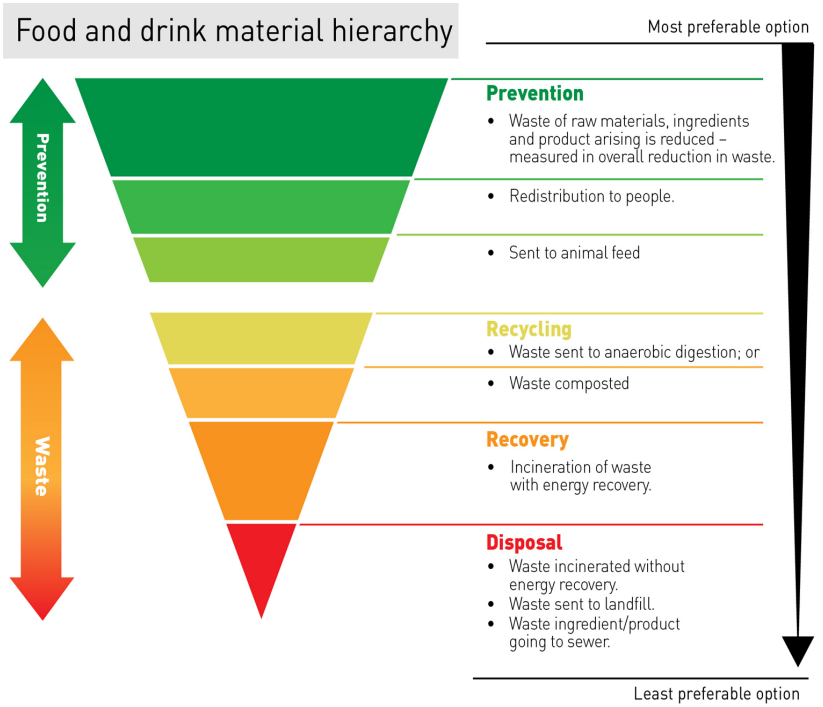
FIGURE 14: Rates of loss and waste at each stage of the supply chain — UK, Rwanda, Vietnam





FLW Reduction is not enough





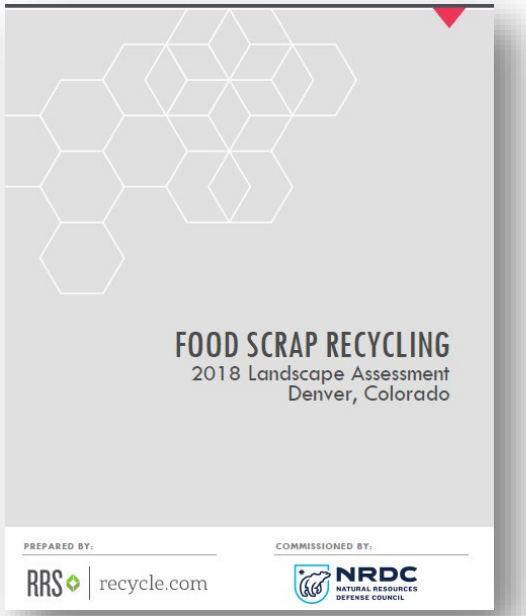
Parry A (2014) UK food waste – Historical changes and how amounts might be influenced in the future. Banbury, UK

FLW action can be at multiple government levels

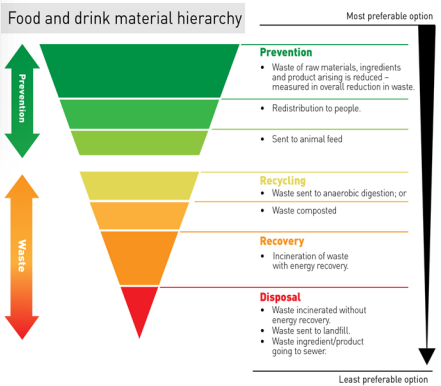
City/LA level, National, Global

Prevention

Diversion



Redistribution
(Food Security?)



Activities in each of these areas can help in the other two.

But, is there coherence in solutions across scales?

Many (food systems) solutions to FLW

	Waste reduction potential	Savings per tonne of waste reduced		
		Climate	Water	Costs
Products, processing and food waste solutions				
Animal feed from insects	■	●	●	●
Processed food waste to chicken feed	■	●	●	●
Dairy waste to animal feed	■	●	●	●
Processing technology to improve shelf life	■	◆	■	◆
Standardised date labelling	◆	■	■	■
Better information for longer shelf life	◆	■	■	■
Fibre products from food waste	◆	●	◆	●
New food products from processing waste	●	●	●	●
Nutrient extraction from processing waste	●	●	●	●
Packaging size and design adjustments	●	■	■	■
Relax produce specifications at retail	●	●	●	◆
Efficient business operations and supply chain solutions				
Waste tracking and analytics	■	◆	■	■
Improved cold chain management	■	◆	◆	■
Whole crop purchase contracts	◆	●	●	●
Centralised and 'dark' commercial kitchens	◆	◆	■	■
Manufacturing line optimisation	●	●	●	●

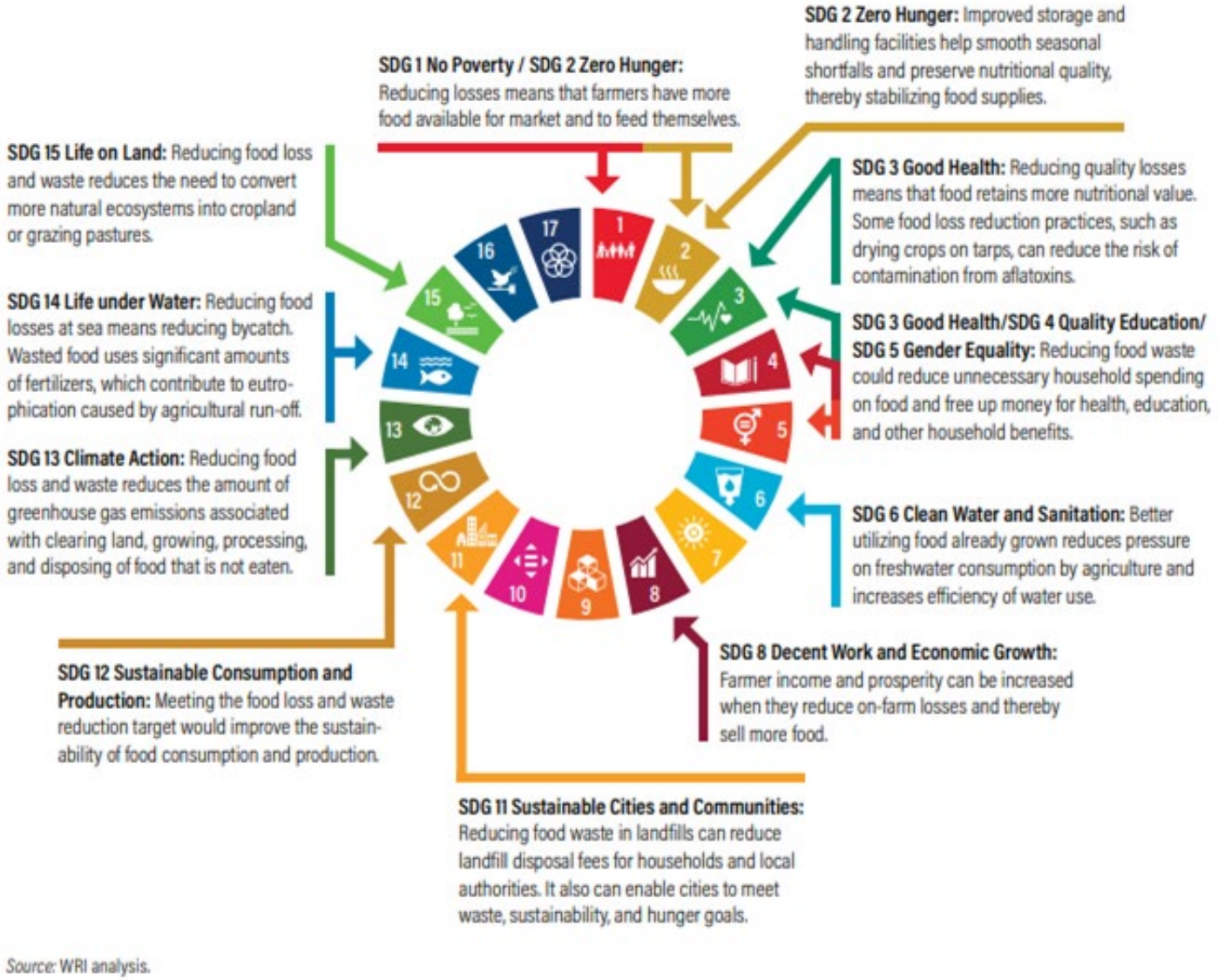
	Waste reduction potential	Savings per tonne of waste reduced		
		Climate	Water	Costs
Education and behaviour change solutions				
Household behaviour change programs	■	■	■	■
Hospitality and food service solutions	◆	■	■	■
Waste audits at hospitality and institutions	◆	■	■	■
Food rescue, recovery and redistribution solutions				
Business-to-consumer platforms	■	◆	■	■
Increase food rescue across supply chain	■	◆	■	◆
Secondary resellers	◆	◆	●	◆
Legislating food rescue at retail	◆	■	●	■
Sustainable catering guidelines and procurement	●	■	■	■
Online platform for surplus products	●	◆	●	◆

■ High impact ◆ Medium impact ● Low impact

The Path to Half 25 solutions

ReFED 73 solutions

FLW solutions can help multiple other areas

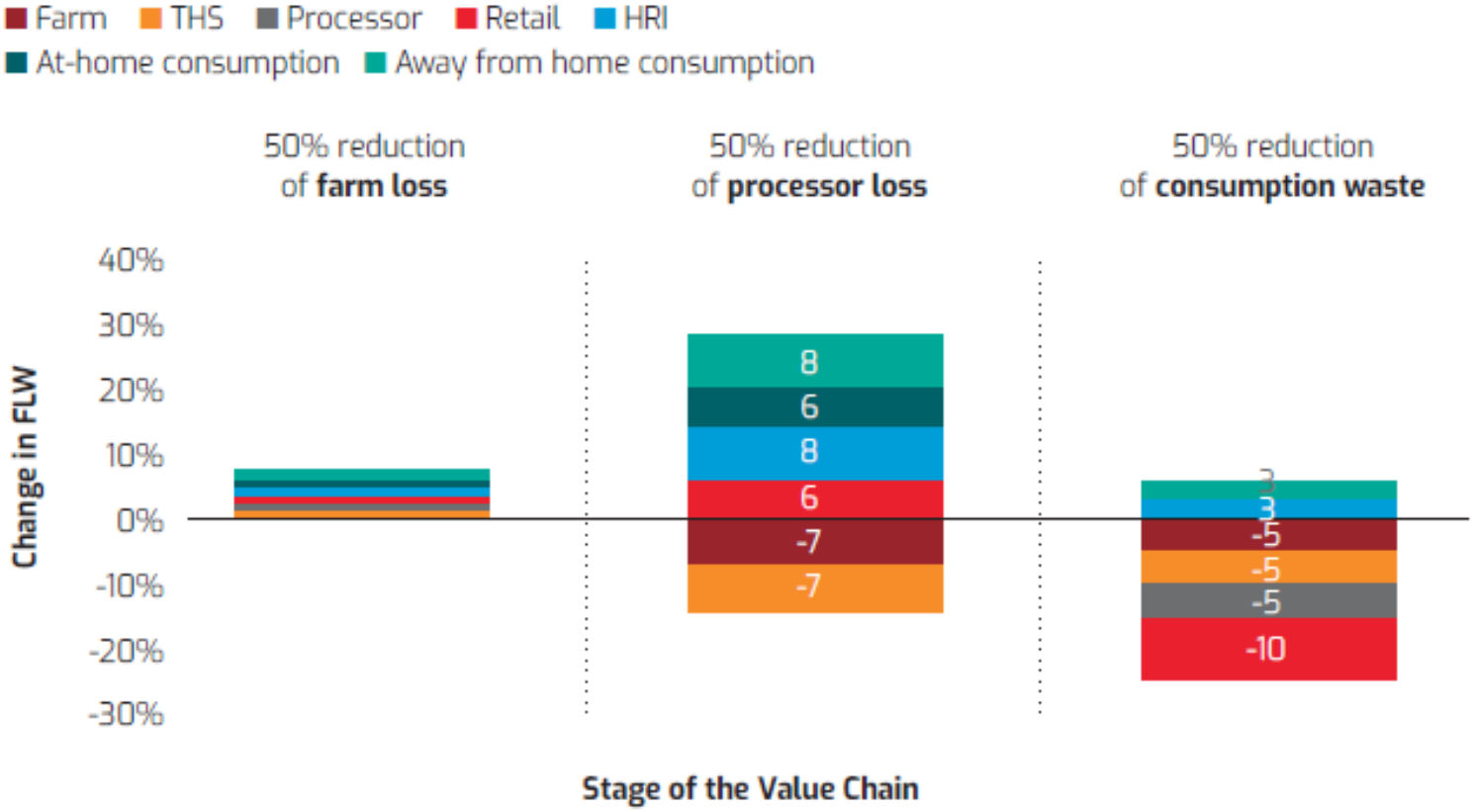


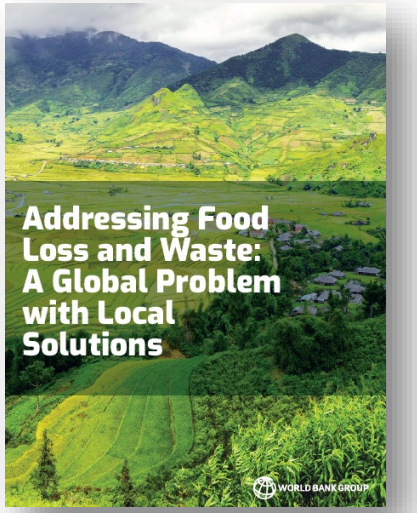
Source: WRI, REDUCING FOOD LOSS AND WASTE Setting a Global Action Agenda https://wriorg.s3.amazonaws.com/s3fs-public/reducing-food-loss-waste-global-action-agenda_1.pdf

Not all solutions are created equal
A 50% reduction in waste… at different stages

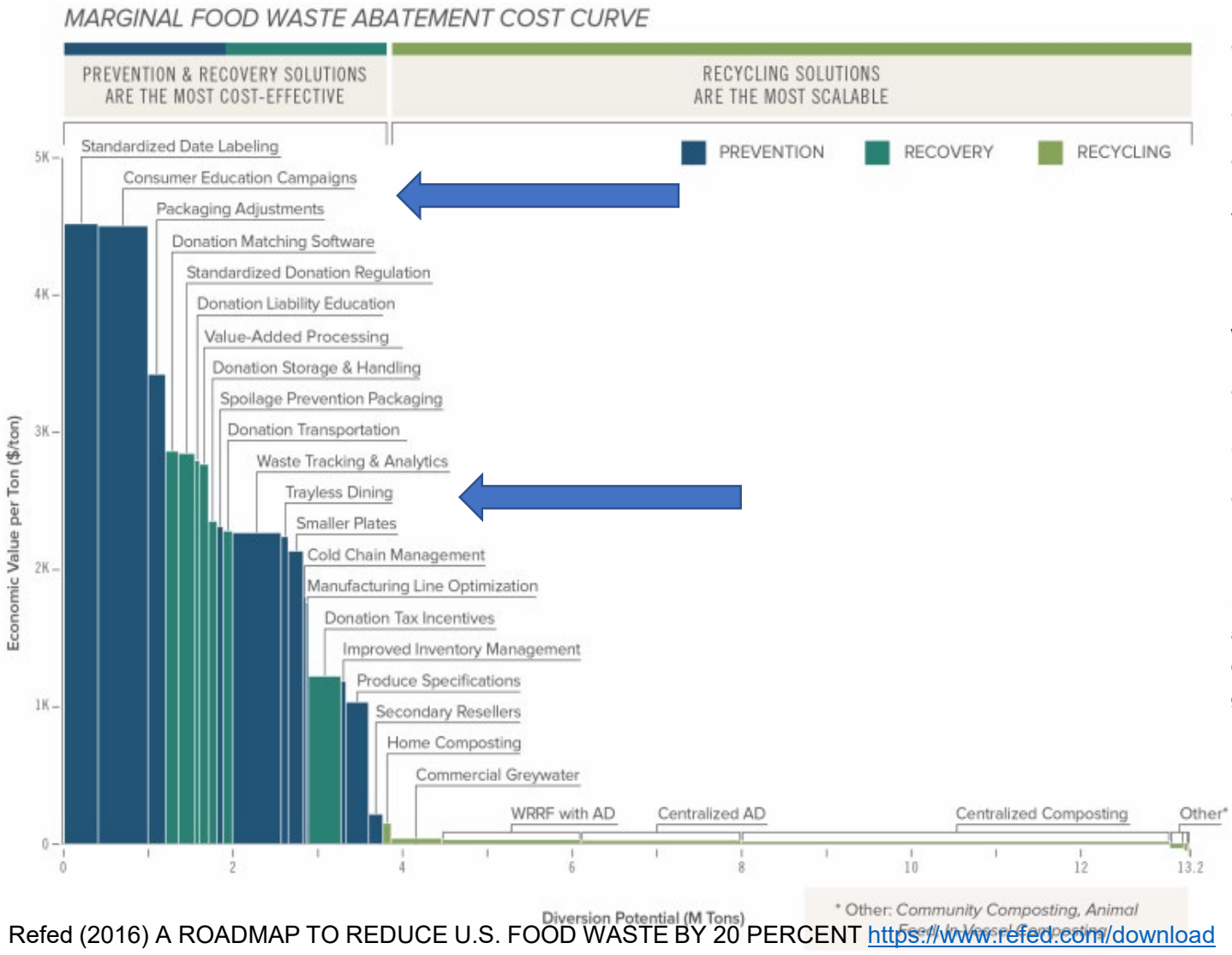
FIGURE 26: The cascading effect is additive

Effect of a 50% FLW reduction at the farm, processor and consumption levels (UK chicken, closed economy)





Many food waste solutions are dietary changes



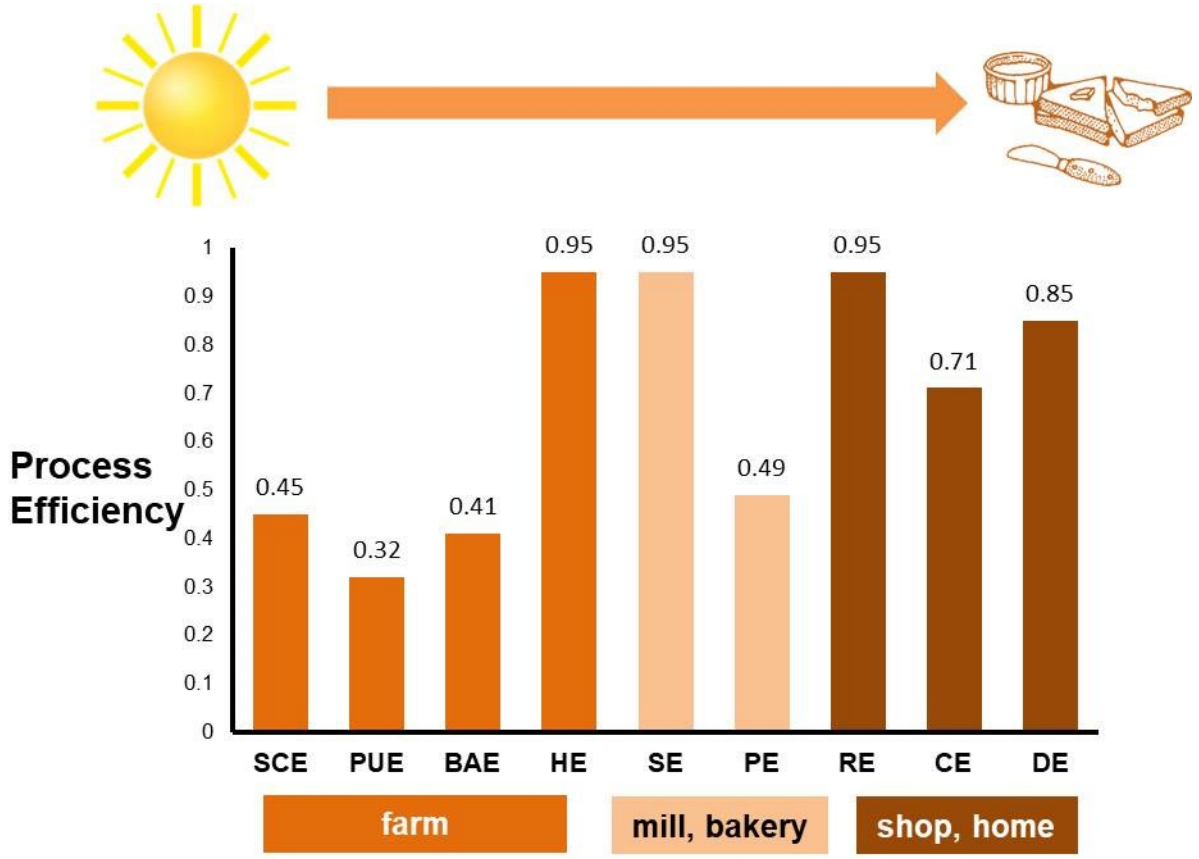
- **Nudges** – reducing plate size, providing social cues. 20% ↓in FW *Kallbekken, (2013)*
- **Changing canteen menus,** ↑ consumption, 18% ↓ in vegetable FW *Schwartz et al (2015) (see also shape of veg too!)*
- **Weight/ of plate** changes the amount of food eaten and wasted *Williamson et al (2016)* **
- **Information** based campaigns, *Schmidt (2016), Manomaivibool et al (2016) Devaney, Davies (2016)***
- **Packaging and portion size** change *Kandemier* (2020)

***** Self reported results.***

Self reported results generally give lower estimates of food waste compared to waste compositional analysis. For diaries – one of the more accurate methods – around 40% less food waste is reported compared to waste compositional analysis. *Høj (2012)* Measuring food waste via caddies or photos gives similar results to diaries. *Van Herpen (2016)*

Refed (2016) A ROADMAP TO REDUCE U.S. FOOD WASTE BY 20 PERCENT https://www.refed.com/download

Diet and Overconsumption can also impact on FLW



Retail Efficiency (RE) – in-store waste 5%
Consumption Efficiency (CE) - cooking waste 29%
Dietary Efficiency (DE) - **overconsumption**? 15%

Additional calories of bread eaten above and beyond 2500kcal per day per person in UK population.

(Increase in fruit and veg may lead to increased inedible food waste)

Horton, P., Reynolds, C.J., Bruce, R. and Milligan, G., 2019. Food Chain Inefficiency (FCI): accounting conversion efficiencies across entire food supply chains to re-define food loss and waste. *Frontiers in Sustainable Food Systems*, *3*, p.79. https://doi.org/10.3389/fsufs.2019.00079

Sustainable diets and The EAT–Lancet report

Setting Scientific Targets for Healthy Diets and Sustainable Food Production.

2500 kcal daily diet.

↑ consumption of fruit (100 -300g/day) & vegetables (200-600g/day)

↓consumption of animal products

The EAT–Lancet report - A Critique

The EAT–Lancet report - A Critique

- Lack of consideration of local and traditional diets, food ways or systems of production.
- Limited suggestions on how to implement the ‘global healthy sustainable diet’. (only photos see →)
- Minimal discussion of cooking.

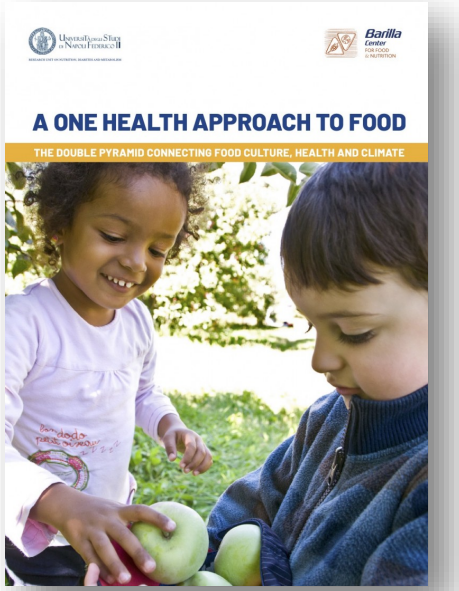


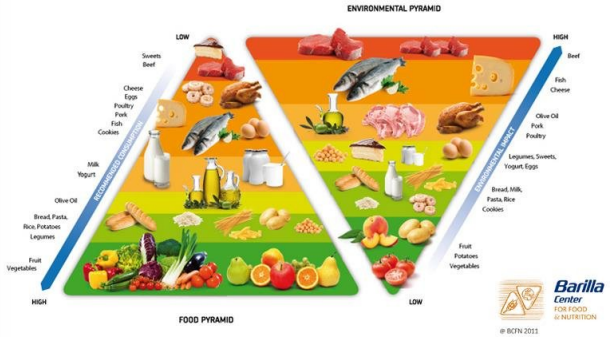
Is gastronomy and cooking important?

Eating habits are a cultural issue

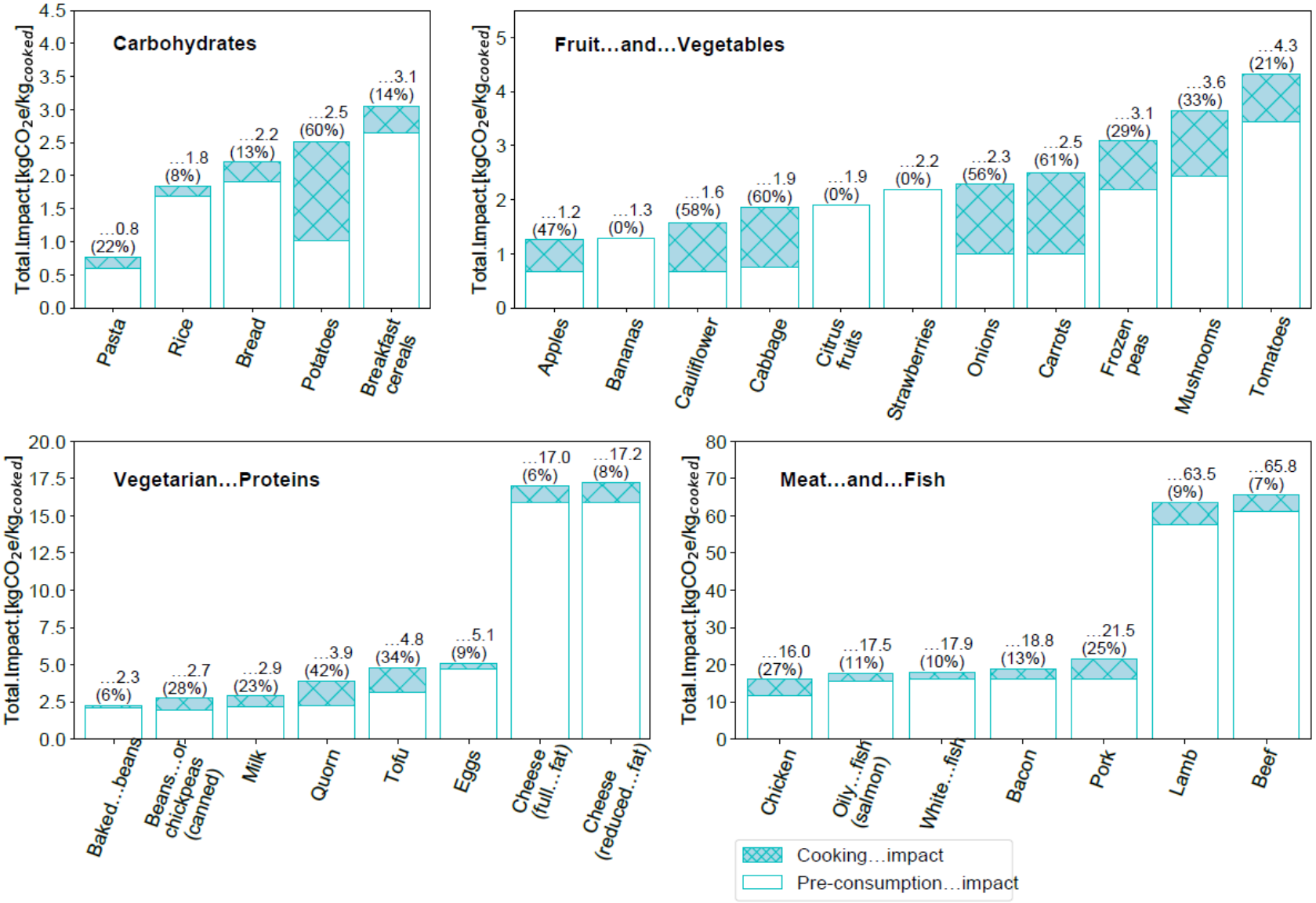
Barilla Center for Food and Nutrition

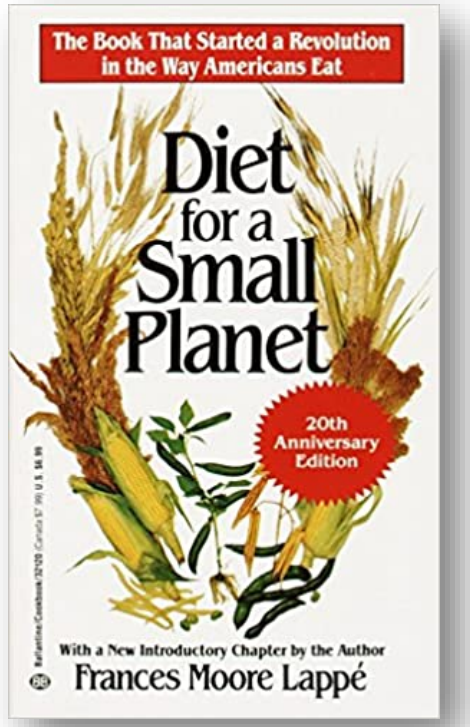
7 different cultural pyramids, specific geographical area (Africa, Western Asia, Eastern Asia, Latin America, the Mediterranean, Nordic countries and Canada, United States).

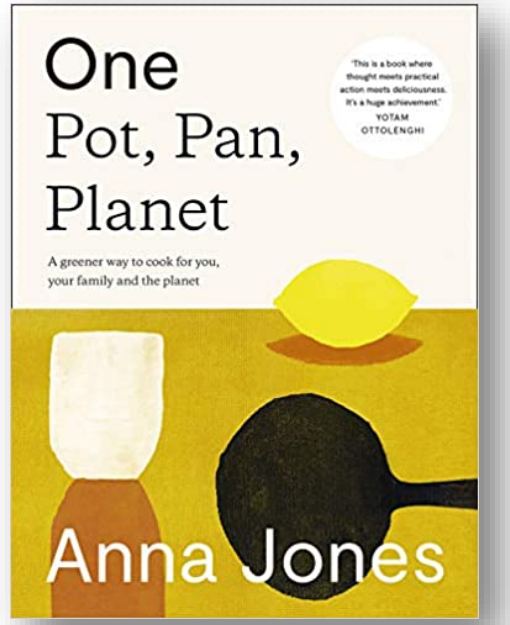




How we cook matters!







Frankowska, A., Rivera, X.S., Bridle, S. *et al.* Impacts of home cooking methods and appliances on the GHG emissions of food. *Nat Food* **1,** 787–791 (2020). https://doi.org/10.1038/s43016-020-00200-w

Disrupting eating (and cooking) for lower carbon emissions

Current guidelines focus on

1) Reducing consumption instances

2) Smaller portion sizes

0-28g per day for beef, lamb or pork

1) Typical beef portion in the UK 70-90g, once weekly

(Cooking in small batches inefficient)

2) Integrate 28g of beef into other dishes

(Cooking in fast/sustainable, Batch cooking)

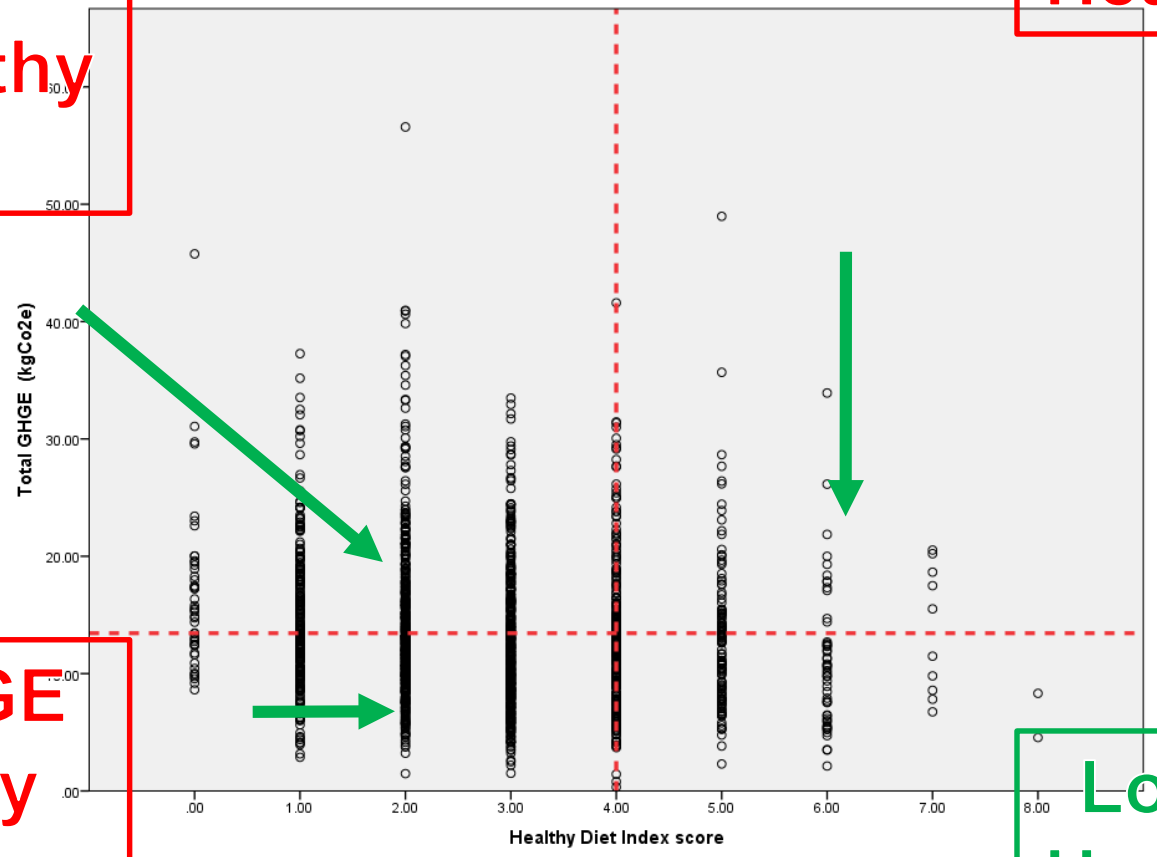
3) Adapt UPFs trends to be lower emissions. E.g. blend with sustainable protein.

(Encourage reheat?; Batch cooking, leftover (re)use)

Lots of different paths to a sustainable diet…

High GHGE Unhealthy diet

High GHGE Healthy diet

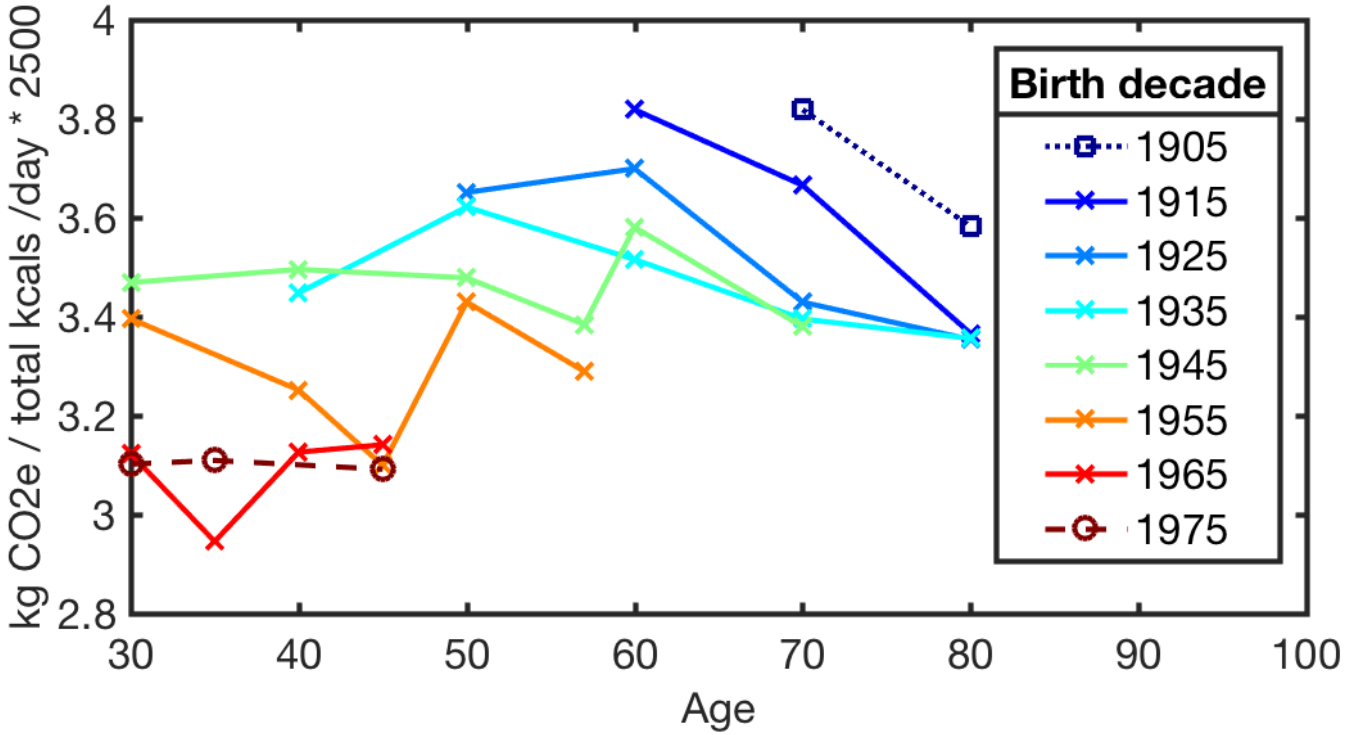


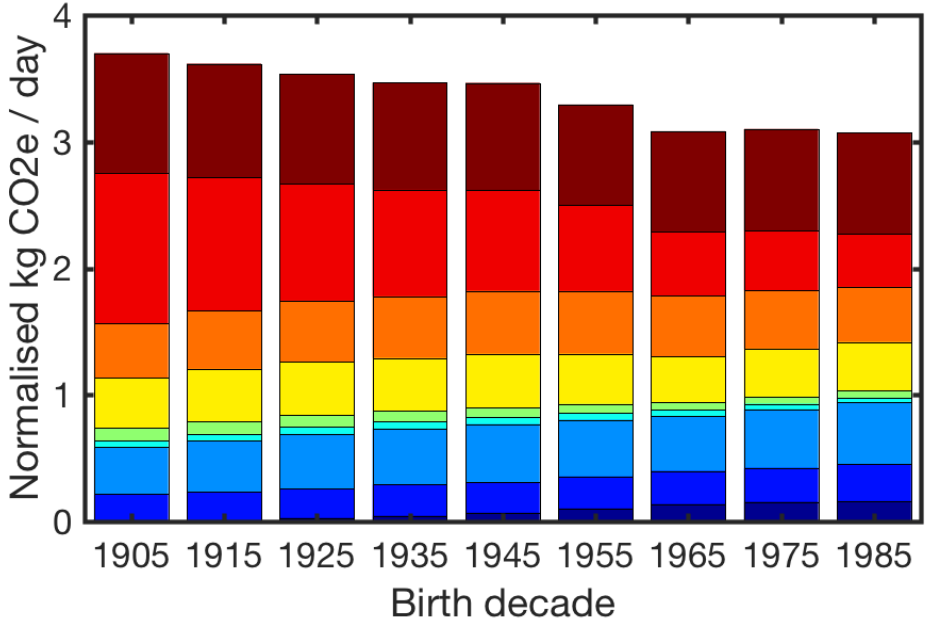
Low GHGE Unhealthy diet

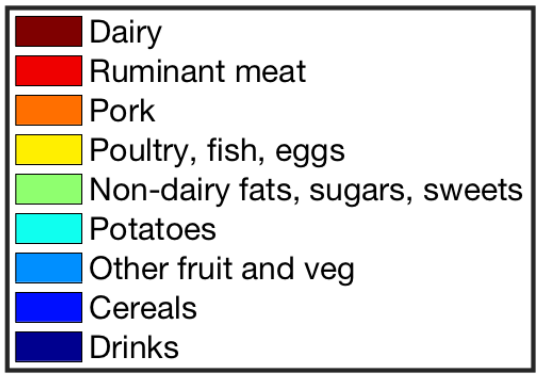
Low GHGE Healthy diet

Source: NDNS translated to HDI score matched with GHGE from Audsley 2010 (modifications by Horgan, Whybrow, and Macdiarmid 2016)

The dietary patterns of the each generation are moving… currently more sustainable in the 2010s+







Kg Co2e per 2500kCal per day, per age group (16+), Purchase surveys 1975-2015

National Food Survey, 1974-2000, Living Cost and Food Survey (2000-2018)

(But we have the rise of Ultra Processed Foods from 1950s onwards)

Multiple synergies between Healthy Sustainable Eating and Food Waste

Integrate Healthy Eating and Food Waste education

- Welsh pilot (Low income communities)

  53% increase in Fruit and Vegetable Consumption

  7% food waste reduction

Hospitality and food service sector can be “champions” of message (and have major wins themselves).

Portions and Pack size can have an effect.

This could also apply to allergen redesign

But how does this work in practice?

In practice… Changing Diets and FLW

TRiFOCAL

- **T**ransforming **C**ity **FO**od h**A**bits for **L**ife (2016-2020)

  WRAP, LWARB, Groundwork London.

  London – and 10 replication cities (EU)

Prevent food waste

Promote healthy and sustainable eating

Recycling of unavoidable food waste.

Citizens

Community Groups

Employers

Hospitality & Food Services

Local Authorities

Schools

In practice… TRiFOCAL

- **T**ransforming **C**ity **FO**od h**A**bits for **L**ife (2016-2020)

  WRAP, LWARB, Groundwork London.

  London – and 10 replication cities (EU)

  9% reduction in avoidable food waste generated per household per week (kg/hh/ wk) between 2017 and 2019. The amount generated fell from 1.59 kg/hh/week to 1.44 kg/hh/week.

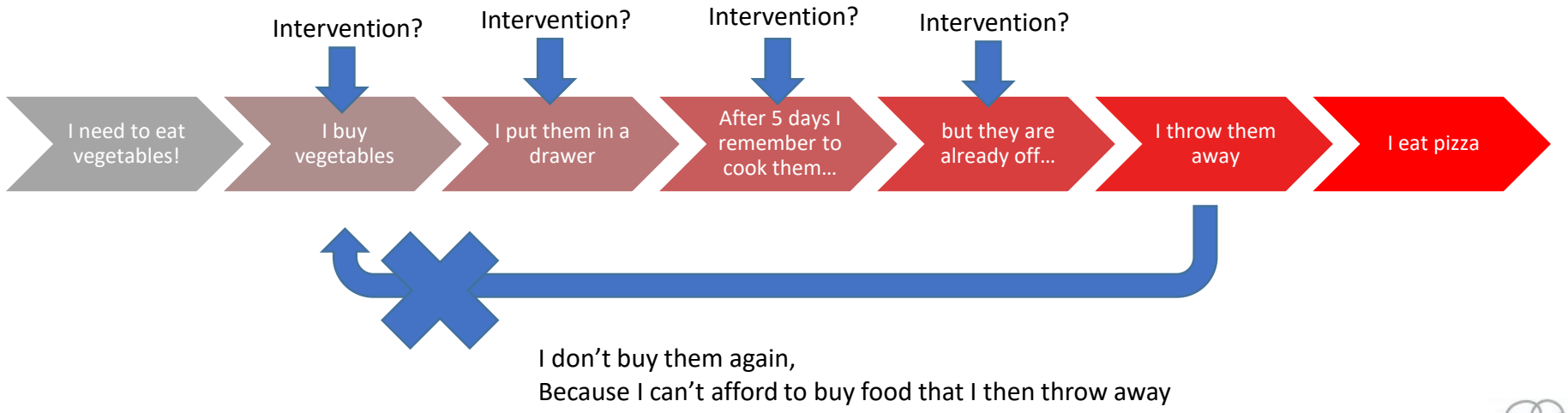
  No change in the weight of unavoidable food waste per household recycled via the caddy. On the other hand, there was a **14% increase** in the amount of avoidable food waste recycled.

  15% increase in Londoners **demonstrating knowledge** of and reporting taking action on healthy sustainable eating, according to the project evaluation survey

In practice…
Multiple solutions needed

Direct Impact (Food waste)
Vs
Secondary Impact (Veg consumption opportunities)

- No single solution to reduce food waste, shift diets etc.
- Multiple innovations needed.



- Unintended consequences or benefits…

Synergies with healthy sustainable eating

Peas Please
Making a pledge for more veg

Multiple solutions need policy coherence

Food policy coherence

The alignment of policies that affect the food system with the aim of achieving health, environmental, social and economic goals, to ensure that policies designed to improve one food system outcome do not undermine others. Food policy incoherence creates problems and misses opportunities.

Health (social) policy goal = to prevent disease and treat and manage ill-health in the population

Environmental policy goal = less deforestation, water pollution, greenhouse gases

Economic policy Goal = growth and competitiveness for income generations and jobs

Policy incoherence

Economic policy or economic policy instruments not fit for purpose in reinforcing environmental and health policy goals

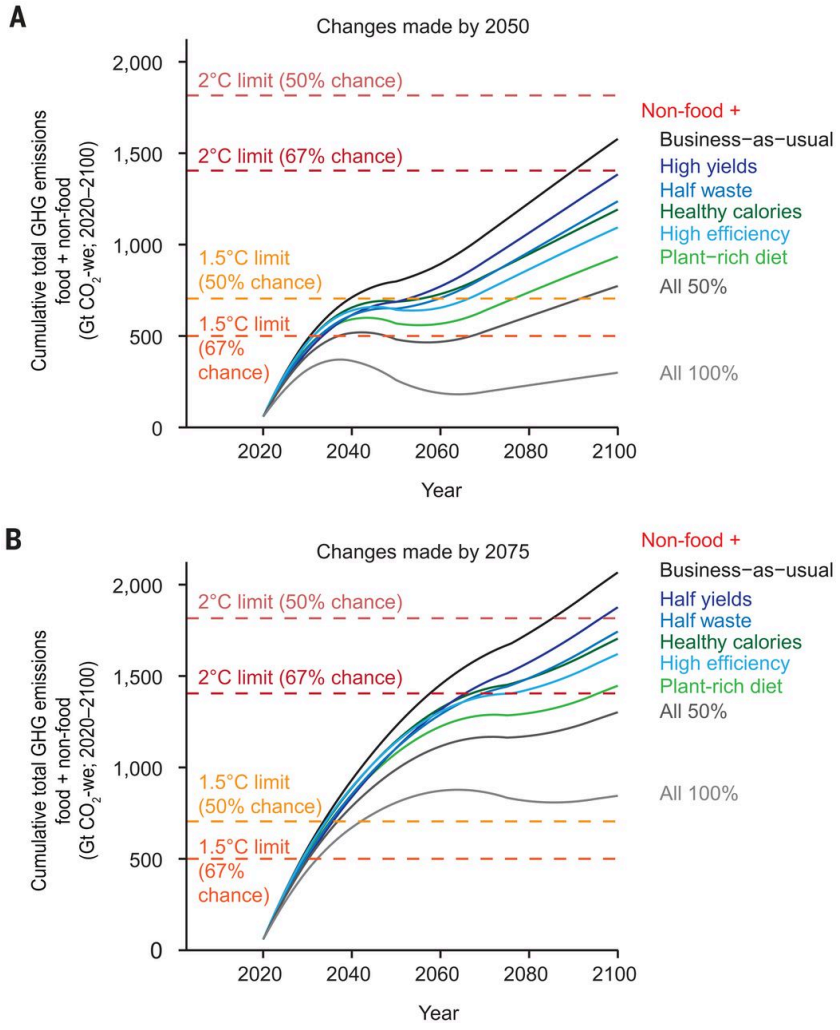
Policy made in different spaces

Parsons K, Hawkes C. Brief 5: Policy Coherence in Food Systems. In: Rethinking Food Policy: A Fresh Approach to Policy and Practice. London: Centre for Food Policy;
2019. https://www.city.ac.uk/__data/assets/pdf_file/0018/504621/7643_Brief-5_Policy_coherence_in_food_systems_WEB_SP.pdf

We need to continue engaging with existing trends to identify coherent solutions.

What policies and trends help our (cool) food system to become a resilient (warm) food system?

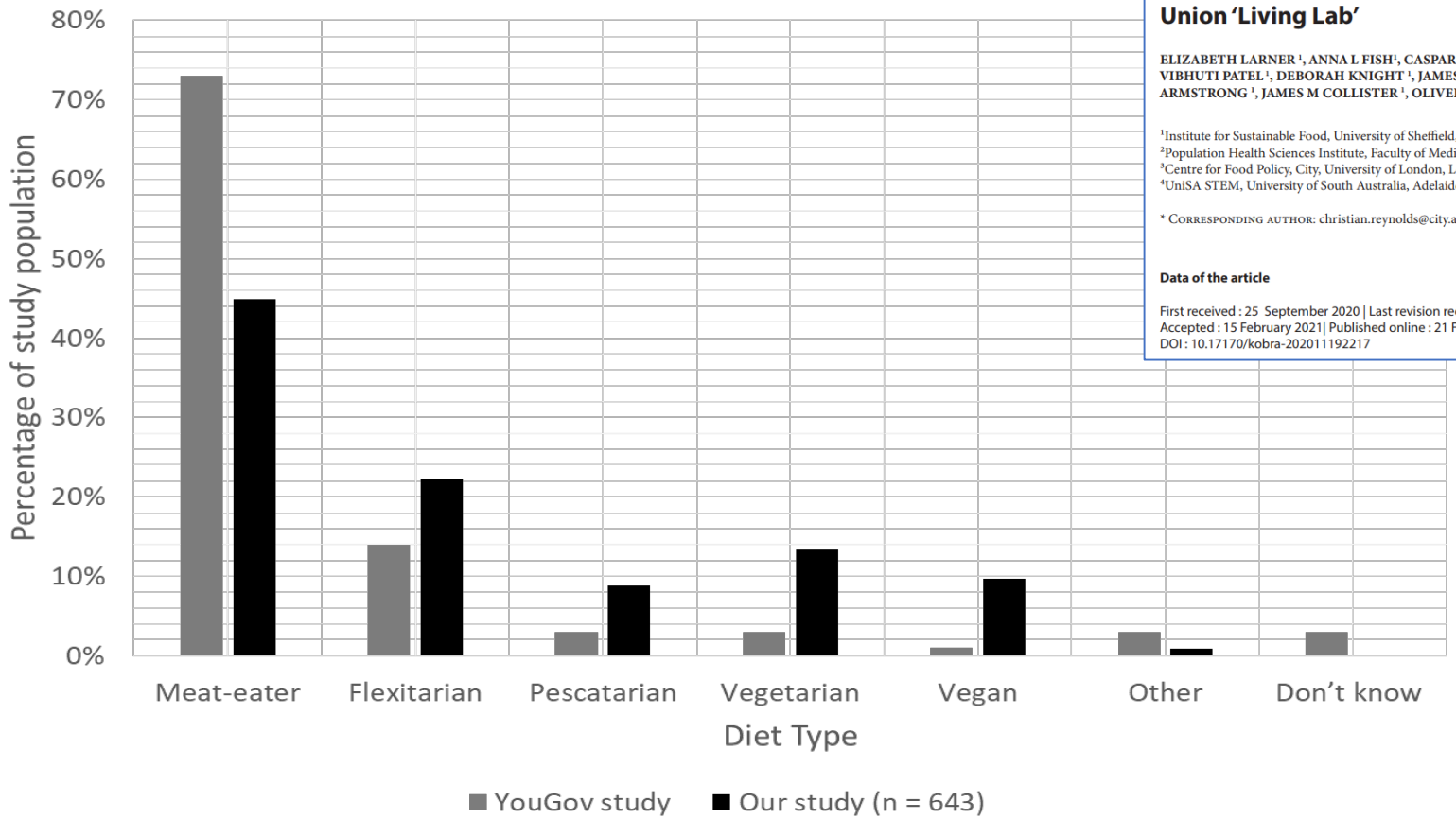
How long do we have to implement these policies?

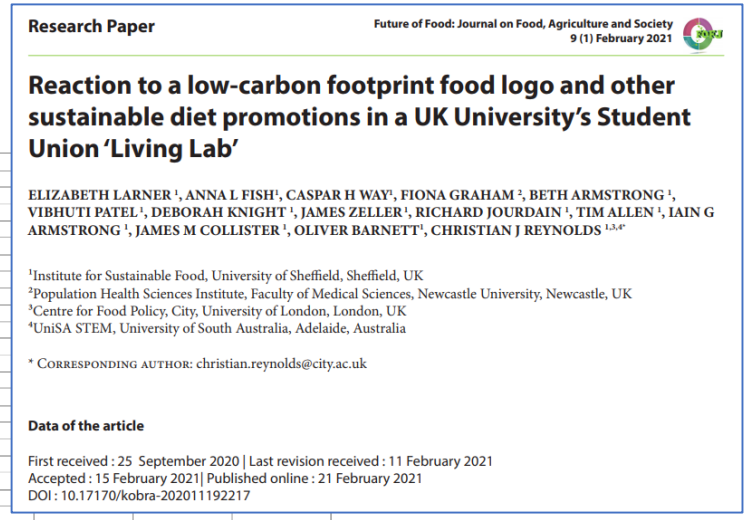


Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets
SCIENCE 06 NOV 2020 : 705-708

What are the changing perceptions and practices?

20%+ the (UK) population now Flexitarian





Research Paper

Future of Food: Journal on Food, Agriculture and Society
9 (1) February 2021

Reaction to a low-carbon footprint food logo and other sustainable diet promotions in a UK University's Student Union 'Living Lab'

ELIZABETH LARNER [1], ANNA L FISH[1], CASPAR H WAY[1], FIONA GRAHAM [2], BETH ARMSTRONG [1], VIBHUTI PATEL [1], DEBORAH KNIGHT [1], JAMES ZELLER [1], RICHARD JOURDAIN [1], TIM ALLEN [1], IAIN G ARMSTRONG [1], JAMES M COLLISTER [1], OLIVER BARNETT[1], CHRISTIAN J REYNOLDS [1,3,4*]

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[2]Population Health Sciences Institute, Faculty of Medical Sciences, Newcastle University, Newcastle, UK
[3]Centre for Food Policy, City, University of London, London, UK
[4]UniSA STEM, University of South Australia, Adelaide, Australia

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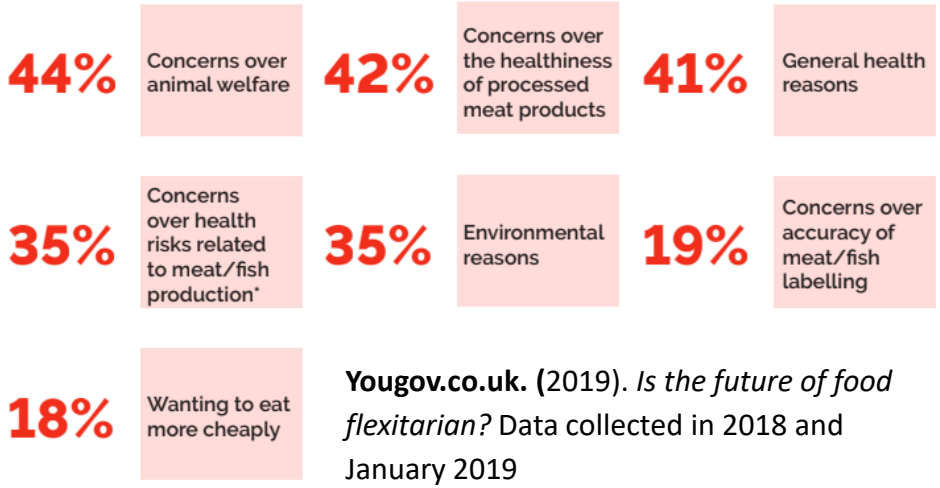
DOI : 10.17170/kobra-202011192217

Yougov.co.uk. (2019). *Is the future of food flexitarian?* Data collected in 2018 and January 2019

Changing perceptions and practices …to reduced meat intake?



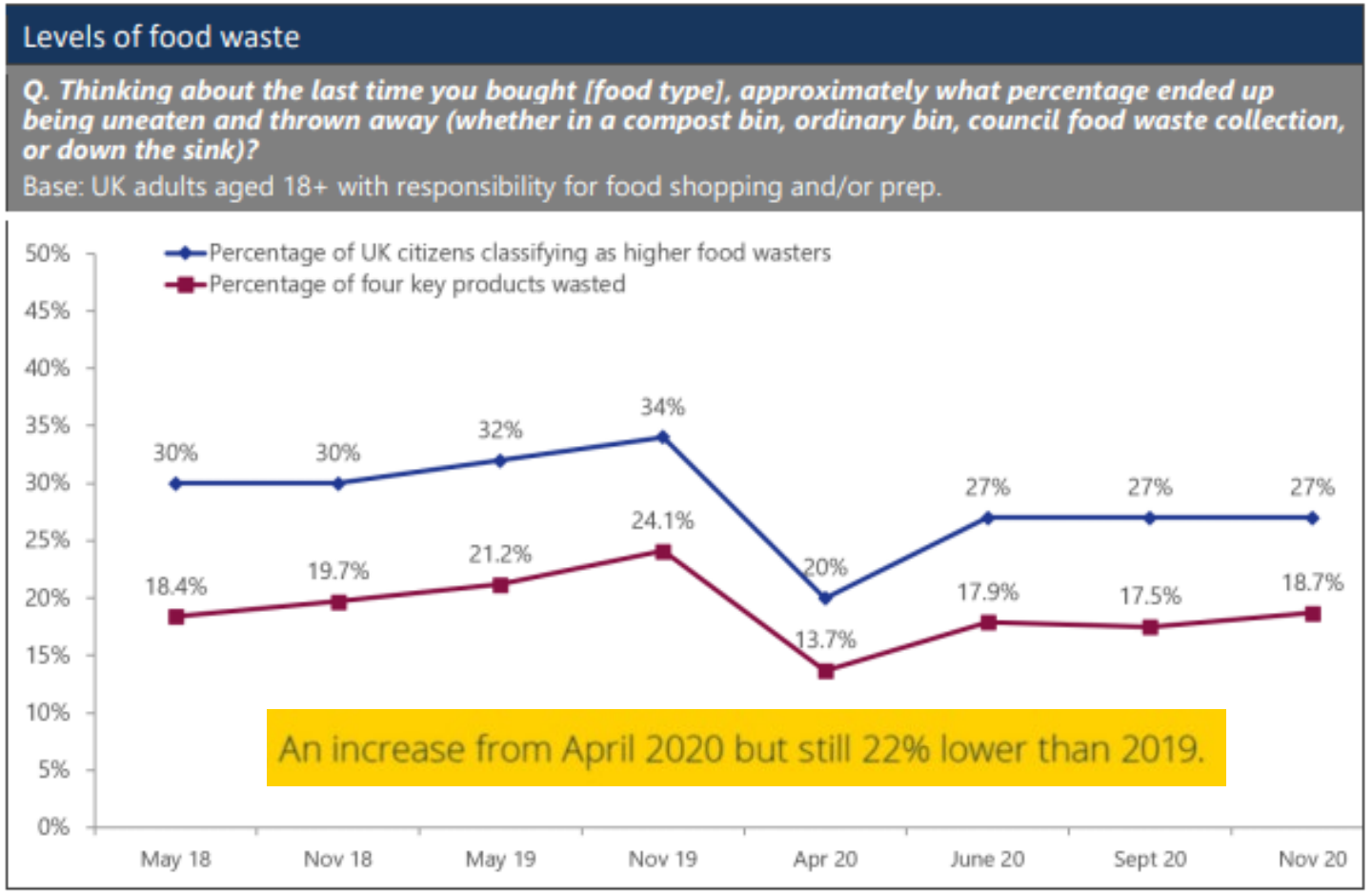
Yougov.co.uk. (2019). *Is the future of food flexitarian?* Data collected in 2018 and January 2019

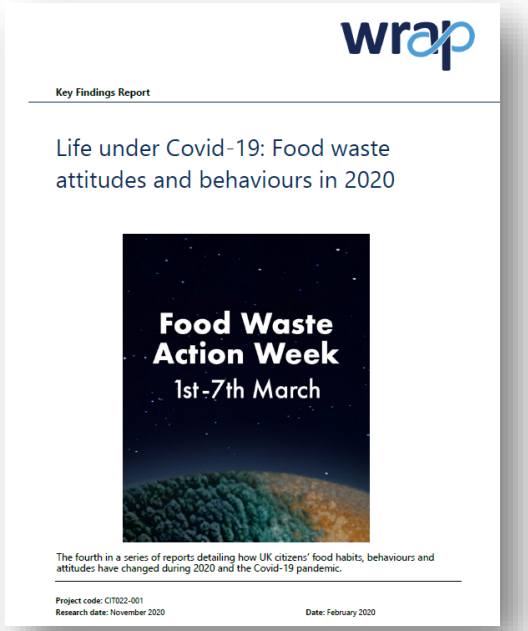
	I do not limit my meat intake	Concern for my health	It's expensive	Animal welfare concerns	Environmental concerns	I do not enjoy the taste of meat	Reglious reasons	Other
Brazil	48.2	32.3	18.7	17.1	13.1	6.2	4.2	0.6
Ghana	20.1	65.2	23	10.8	14.2	9.8	17.2	2.5
India	14.8	42.7	12.6	28.9	29.7	13.7	29.9	10.6
Kenya	24.7	55.2	29.4	10.3	10.8	6.2	10.3	2.1
Nigeria	32.2	55.1	22.4	6.8	6.8	4.4	10.7	3.4
Argentina	44.3	29.5	24.5	15.4	11.6	7	3	1.3
Colombia	41.7	39	12.2	16.3	13.4	3.3	2.7	1.7
Peru	40	36.2	15.5	14.2	12.5	5.7	4.2	1.1
UK	37.7	28.4	18.4	31.4	32.1	11.2	1.9	4
USA	58.8	19.6	10.8	9.3	13.1	7	N/A	1
Australia	59.8	17.9	15.9	10.2	9.2	8.2	N/A	3.6

Phase 3 Cooking survey (collected in 2020) Multi county results – Reasons you limit your meat intake. (Being published in 2021**)**

Different drivers of change can lead to different mixes of policy solutions

COVID-19 as a moment of change – are we starting to see the new normal?





Online survey Apr, June, Sept, Nov 2020 with a nationally representative sample of 4,000 UK adults aged 18+

https://wrap.org.uk/sites/default/files/2021-02/WRAP-Life-under-Covid-19-Food-waste-attitudes-and-behaviours-in-2020.pdf

Final thoughts…

- We need to change diets and FLW as part of creating a resilient food system.
- We have a wide menu of policy options to select from.
- Not all of these solutions are coherent to all food system goals, or right for every geography, culture etc.
- We can use existing trends as a basis to identify the solutions that work and are coherent, and can make a difference in the next 10 years.

Please do get in touch

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https://www.city.ac.uk/prospective-students/courses/postgraduate/food-policy