Holy Cow!
Beef production and a warming planet

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3 November 2022

Thursday the 3rd from 1:15 to 2:45 pm.

virtually at the

6th Canadian Association for Food Law and Policy Conference.

Panel:

"Holy Cow?: Beef Production and a Warming Planet".

The Centre for Health Science and Law a non-profit health advocacy organization focusing on food with a mission to help make Canadians more savvy eaters and governments and industry more accountable.

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23 slides with headlines at the top

- **Highlights in bold red** (or images)
- Details in regular black typeface
- Citations in smaller text (to use later to find source material, etc.)
- Bulk of slides pertain to the size of the problem and effectiveness of solutions

- Preview: 2 questions about labelling re Codex & common law duty to warn
- Recap of recent presentation about investment risk
- Nexis with health risk
- Common law criteria for warning adequacy

Conflict of Interest Disclosure

***New England Journal of Medicine* format…**

(possibly slightly outdated, ref. https://www.icmje.org/about-icmje/)

- Did you or your institution at any time receive payment or services from a third party **(government, commercial, private foundation, etc.)** for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.)? Are there any relevant conflicts of interest? **NO**
- financial relationships (***regardless of amount of compensation***) with entities… **during the 36 months prior to publication.** Are there any relevant conflicts of interest? **NO**
- any **patents**, whether planned, pending or issued, broadly relevant to the work? **NO.**
- Are there **other relationships or activities that readers could perceive to have influenced**, or that give the appearance of potentially influencing, what you wrote in the submitted work? **NO.**

How CHSL advocates public health nutrition law reforms

- **Publish:** *Food for Life Report*, policy reports, journal articles, op-eds, book chapters, briefing notes, technical briefs, news releases, etc., including most recent two chapters in the first Canadian food law textbook, *Food Law and Policy in Canada, (*Thomson Reuters Canada, 2019)
- **Testify:** before legislative committees, esp. House of Commons Standing Cttee. on Health and the relying on research published by the World Health Org., U.S. National Academy of Medicine, United Nations, OECD, UNICEF, the Supreme Court, etc., etc.)
- **Media**: interviews for print, and broadcast media
- **Participate:** in formal advisory committees, e.g., the Trans Fat Task Force, Sodium Working Group and standard-negotiating bodies such as the Codex Food Labelling Cttee and the U.N. Human Rights Council negotiations on a still-draft treaty on business and human rights
- **Convene:** conferences of experts, policy-makers and journalists, including the Biennial Championing Public Health Nutrition
- **Meet elected officials and government bureaucrats:** esp. at Health Canada, Canada Food Inspection Agency, the House of Commons and Senate committees, and occasionally, in provincial and municipal health authorities
- **Litigate:** Recently, related to pesticide approvals in Canada.
- **Mobilize supporters:** meet, call, and write NGOs, experts and grassroots supporters, other intermediary decision-makers to:
  - seek their advice (and share ours), and
  - mobilize their support (and offer ours).

QUESTION 1: Will Canada mandate labelling of the greenhouse gas emissions and climate-warming risk of cattle-related food while it presides over a proposal for global sustainability labelling at the Codex Committee on Food Labelling?

CODEX ALIMENTARIUS COMMISSION

Food and Agriculture Organization of the United Nations

World Health Organization

Viale delle Terme di Caracalla, 00153 Rome, Italy - Tel: (+39) 06 57051 - E-mail: codex@fao.org - www.codexalimentarius.org

CL 2022/12-FL
March 2022

TO: Codex Contact Points
Contact Points of international organizations having observer status with Codex

FROM: Secretariat, Codex Alimentarius Commission,
Joint FAO/WHO Food Standards Programme

SUBJECT: Request for information sustainability labelling

DEADLINE: 15 July 2022

REPLIES: **To: Codex contact point NZ**
Email: codexnz@mpi.govt.nz

Copy to: Phillippa Hawthorne & Kati Laitinen
E-mail:
Phillippa.hawthorne@mpi.govt.nz
Kati.laitinen@mpi.govt.nz

Introduction

Increasing global awareness on sustainability, including the impacts of climate change and the need to preserve our natural resources, has resulted in a focus on providing consumers with greater information on the sustainability of food products. The conclusion of the UN Food Systems Summit in September 2021 reinforced the importance of sustainability and the need for consumers to be making purchases with a sustainability lens. There is also an increasing number of sustainability-based labels being developed for food products with varying criteria as the basis for the labels. This was raised at the Codex Committee for Food Labelling (CCFL) meeting in September 2021. As a result, it was agreed that New Zealand, assisted by the European Union, would draft a discussion paper to explore possible work on sustainability labelling within the mandate of CCFL.

The discussion paper will explore the current and planned use of sustainability labelling on food and whether there is any role for CCFL in providing global guidance in this area or whether such labelling is outside the mandate of CCFL. To inform the discussion paper, a stocktake of sustainability labelling being used or developed in participating countries will be undertaken. This circular letter aims to gather the information for that stocktake.

Background

A number of definitions of sustainability exist. These are underpinned by various pillars/principles which cover different aspects. Most agree that sustainability is holistic and includes consideration of environmental, economic and social aspects. For the purposes of this stocktake it is intended to use the United Nations definition as a guide. The United Nations broadly defines sustainability as:

> *"meeting the needs of the present without compromising the ability of future generations to meet their own needs."*

Three pillars: environmental, economic and societal sustainability are considered to contribute to this broad definition.

- "Environmental sustainability" focuses on maintaining all the earth's environmental systems in balance with natural resources consumed only at a rate that they can be replenished.

Centre for Health Science and Law
Non-profit publisher of Food for Life Report

Elissa Gauthier, Project Officer
Codex Program Services
Office of the Codex Contact Point for Canada
Ottawa, Canada
Via email to: codex_canada@hc-sc.gc.ca

April 14, 2022

Re: CCFL-Session 47-CL 2022/12-FL - Request for information on sustainability labelling

Dear Mme. Gauthier:

Please consider the following comments in deciding the position and approach of the Government of Canada on proposed guidance on sustainability labelling at the Codex Committee on Food Labelling. The Circular Letter CL 2022/12-FL request for input invites comments in the form of information about existing sustainability systems that are predominantly voluntary labelling systems that are poorly suited to help achieve greenhouse gas emission targets by their failure to compel disclosure of the greatest food risks of GHG emissions and being prone to trivialize those risks with similar-sounding sustainability claims. Instead, consider the following early in the stock-take exercise.

1. The importance of environmental impact labels, especially revealing the impact of cattle.

I trust that Canada will play a positive leadership role on this work considering its stated commitment to reducing greenhouse gas emissions. As the Government of Canada and Prime Minister Trudeau so-often assert, climate change is pressing global threat that requires urgent corrective action. According to the Liberal Government's 2021 Liberal election platform (at page 42), Greenhouse Gas emissions from the oil and gas sector have risen since 2005 to comprise 26% of Canada's total emissions, making it the largest emitting sector in Canada.[1] The election platform was silent on the contribution of food systems or livestock to climate change.

However, the United Nations Intergovernmental Panel on Climate Change (IPCC) estimates that 21–37% of total global greenhouse gas (GHG) emissions are attributable to food systems and that climate change will have important negative impacts on food security.[2] The food system rivals the energy sector for contributions to greenhouse gas emissions according to the IPCC, which contributed 35% of GHGs in 2010.[3] Consumers in high-income countries (like Canada) are still consuming high levels of red and processed meat; although the downward shifts in some socioeconomic and demographic groups is encouraging, consumption in low- and middle-income countries is rising, especially in China and Brazil, and in urban areas.[4]

However, a recent study conducted by researchers at Johns Hopkins University and New York University concluded that the conventional method for calculating methane gas contributions by livestock underestimate its impact on climate in high-income countries like Canada and the United States to the extent the true methane contributions of meat and dairy production may be 39% to 90% higher.[5] Methane accounts for 14% of total global greenhouse gas emissions and is 67 times more potent than CO_2 in temperature change potential after 20 years according to the UN IPCC.[6]

QUESTION 2: Does the common law already require sellers of beef products to disclose the climate-warming risk of beef pursuant to the common law duty to warn?

634 HOLLIS *v.* DOW CORNING CORP. [1995] 4 S.C.R.

Dow Corning Corporation *Appellant*

v.

Susan Hollis and John Robert Birch *Respondents*

INDEXED AS: HOLLIS *v.* DOW CORNING CORP.

File No.: 23776.

1995: February 2; 1995: December 21.

Present: La Forest, L'Heureux-Dubé, Sopinka, Gonthier, Cory, McLachlin and Iacobucci JJ.

ON APPEAL FROM THE COURT OF APPEAL FOR BRITISH COLUMBIA

Torts — Manufacturers' duty to warn — Learned intermediary — Breast implant ruptured — Patient not previously warned by doctor of post-surgical risks or of possibility of implant rupture — Whether or not manufacturer had duty to warn patient and/or doctor — Whether or not principles of learned intermediary affecting duty of manufacturer to warn patient directly.

Torts — Causation — Whether subjective or objective test to patient's decision to undergo surgery knowing risks — Whether manufacturer entitled to escape liability on what doctor would have done if properly warned.

Practice — Appellate court powers — Finding of fact — Whether finding of fact can be made by appeal court or whether matter should be referred to trial court.

In 1983, Ms. Hollis, on the advice of her surgeon (Dr. Birch), underwent breast implant surgery to correct a congenital deformity. She was not warned by him of the risks of post-surgical complications or of the possibility that the implants might rupture inside her body. In 1984, after further surgery and an examination by Dr. Birch, who gave the opinion that there was no problem with her breasts, Ms. Hollis began a baker's course which required vigorous upper body movement. In 1985, Ms. Hollis noticed a lump in her right breast and began to feel pain there as well as in her right side. She attended another surgeon, Dr. Quayle, who operated to remove

Dow Corning Corporation *Appelante*

c.

Susan Hollis et John Robert Birch *Intimés*

RÉPERTORIÉ: HOLLIS *c.* DOW CORNING CORP.

N° du greffe: 23776.

1995: 2 février; 1995: 21 décembre.

Présents: Les juges La Forest, L'Heureux-Dubé, Sopinka, Gonthier, Cory, McLachlin et Iacobucci.

EN APPEL DE LA COUR D'APPEL DE LA COLOMBIE-BRITANNIQUE

Responsabilité délictuelle — Obligation de mise en garde du fabricant — Intermédiaire compétent — Rupture d'un implant mammaire — Omission par le médecin de mettre la patiente en garde contre les risques de complications postopératoires ou la possibilité de rupture de l'implant — Le fabricant avait-il l'obligation de mettre la patiente et/ou le médecin en garde? — Les principes de l'intermédiaire compétent modifient-ils l'obligation du fabricant de mettre la patiente en garde directement?

Responsabilité délictuelle — Causalité — Doit-on appliquer le critère subjectif ou objectif à la décision du patient de subir une opération chirurgicale en étant informé des risques? — Le fabricant peut-il échapper à toute responsabilité du fait de ce que le médecin aurait fait s'il avait été adéquatement mis en garde?

Pratique — Pouvoirs de la cour d'appel — Conclusion de fait — La cour d'appel peut-elle tirer une conclusion de fait ou l'affaire doit-elle être renvoyée en première instance?

En 1983, sur les conseils de son chirurgien (Dr Birch), Mme Hollis a subi une implantation de prothèses mammaires pour corriger une malformation congénitale. Le chirurgien ne l'a pas mise en garde contre les risques de complications postopératoires et ne l'a pas avertie de la possibilité d'une rupture interne des implants. En 1984, après une deuxième opération et un examen par le Dr Birch, lequel n'a diagnostiqué aucun problème, Mme Hollis a commencé à suivre un cours de boulangerie, qui l'obligeait à remuer énergiquement le torse et les bras. En 1985, Mme Hollis a remarqué la présence d'une masse au sein droit et a commencé à ressentir une dou-

1995 CanLII 55 (SCC)

Former Justice La Forest held in Hollis,

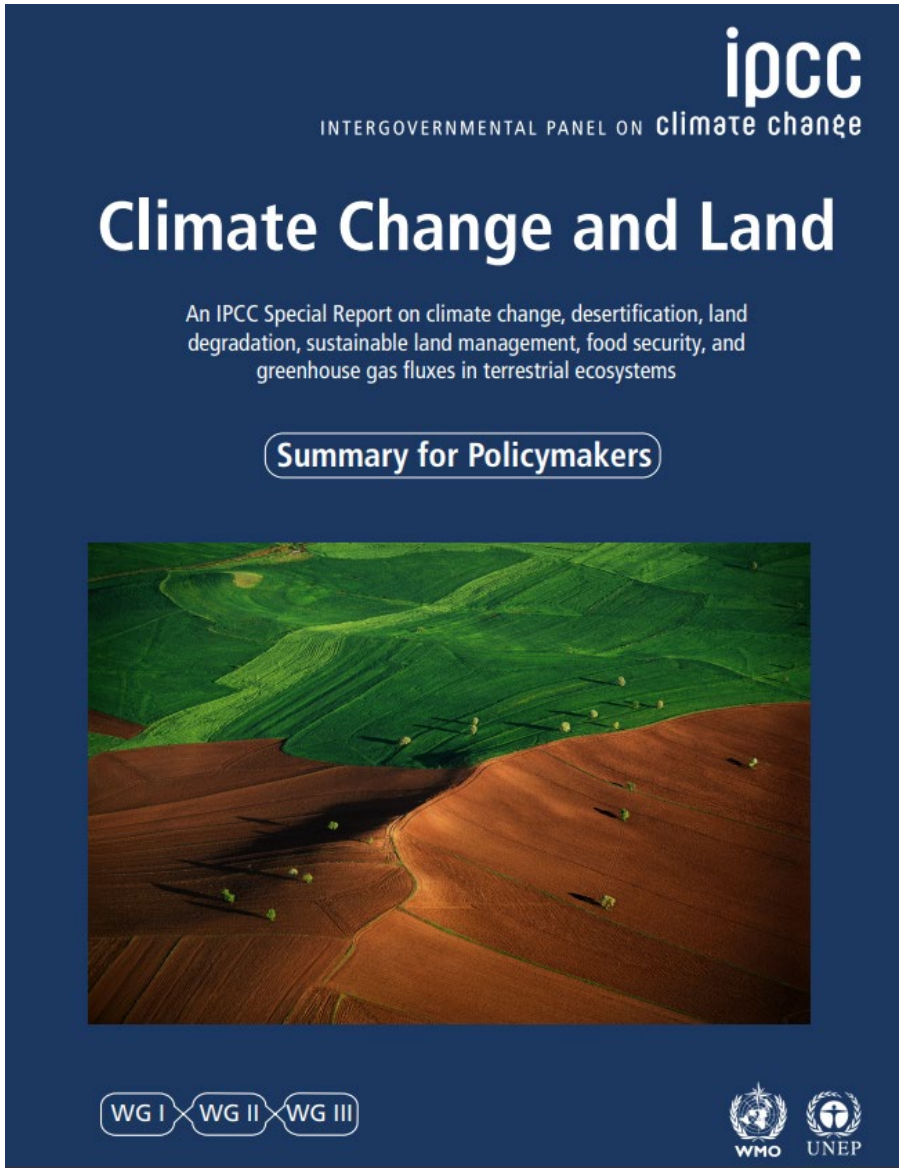
- **"[t]he duty to warn serves to correct the knowledge imbalance between manufacturers and consumers by alerting consumers to any dangers and allowing them to make informed decisions concerning the safe use of the product."**

Buchan v. Ortho Pharmaceutical (Canada) Ltd., 1986 CanLII 114 (ON CA), <https://canlii.ca/t/1npp9>, retrieved on 2022-10-31; affirmed by Hollis v. Dow Corning Corp., 1995 CanLII 55 (SCC), [1995] 4 SCR 634, <https://canlii.ca/t/1frdr>, retrieved on 2022-11-01

- *Per Dickson v Broan-NuTone Canada Inc*, [2007] OJ No 5114 (QL) at para 30, 2007 Carswell Ont 9931, **"the leading statement on the duty to warn remains … *Lambert*."** *Lambert* v. *Lastoplex Chemicals*, 1971 CanLII 27 (SCC), [1972] SCR 569, <https://canlii.ca/t/1twsz>, retrieved on 2022-10-31

  Ironically, the Lambert case was about the harm caused by the pilot light of a methane-fueled furnace (i.e., natural gas) igniting an aerosolized sealant causing an explosion that inflicted serious heat-related injury and property damage.

21–37% of total GHG emissions due to food system & climate change will hurt food security.

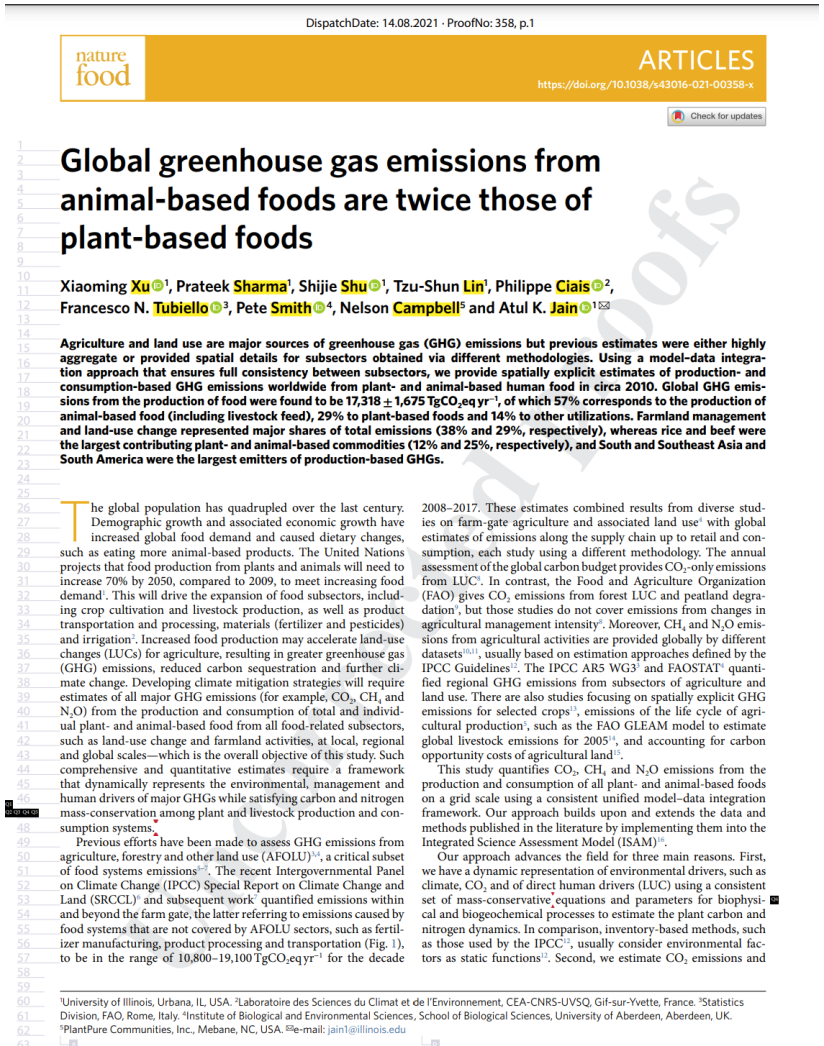


The United Nations Intergovernmental Panel on Climate Change indicated that the vast majority of food-related contributions to harmful greenhouse gas emissions emanate from cattle and that food systems contribute 21–37% of total global greenhouse gas (GHG) emissions—rivaling the energy sector's contribution of 35% in 2010**[1]**—and that climate change will have important negative impacts on food security.**[2]**

[1] Intergovernmental Panel on Climate Change. Energy Systems. 2020. Available at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter7.pdf

[2] Intergovernmental Panel on Climate Change (IPCC). Special Report: Special Report on Climate Change and Land, CH05, Food Security. Executive Summary. 2019. Available at: https://www.ipcc.ch/src_cl/chapter/chapter-5/

57% of GHG related to food systems due to livestock



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nature food

ARTICLES

https://doi.org/10.1038/s43016-021-00358-x

Check for updates

Global greenhouse gas emissions from animal-based foods are twice those of plant-based foods

Xiaoming Xu[1], Prateek Sharma[1], Shijie Shu[1], Tzu-Shun Lin[1], Philippe Ciais[2], Francesco N. Tubiello[3], Pete Smith[4], Nelson Campbell[5] and Atul K. Jain[1]

Agriculture and land use are major sources of greenhouse gas (GHG) emissions but previous estimates were either highly aggregate or provided spatial details for subsectors obtained via different methodologies. Using a model–data integration approach that ensures full consistency between subsectors, we provide spatially explicit estimates of production- and consumption-based GHG emissions worldwide from plant- and animal-based human food in circa 2010. Global GHG emissions from the production of food were found to be 17,318 ± 1,675 $TgCO_2eq\ yr^{-1}$, of which 57% corresponds to the production of animal-based food (including livestock feed), 29% to plant-based foods and 14% to other utilizations. Farmland management and land-use change represented major shares of total emissions (38% and 29%, respectively), whereas rice and beef were the largest contributing plant- and animal-based commodities (12% and 25%, respectively), and South and Southeast Asia and South America were the largest emitters of production-based GHGs.

The global population has quadrupled over the last century. Demographic growth and associated economic growth have increased global food demand and caused dietary changes, such as eating more animal-based products. The United Nations projects that food production from plants and animals will need to increase 70% by 2050, compared to 2009, to meet increasing food demand[1]. This will drive the expansion of food subsectors, including crop cultivation and livestock production, as well as product transportation and processing, materials (fertilizer and pesticides) and irrigation[2]. Increased food production may accelerate land-use changes (LUCs) for agriculture, resulting in greater greenhouse gas (GHG) emissions, reduced carbon sequestration and further climate change. Developing climate mitigation strategies will require estimates of all major GHG emissions (for example, CO_2, CH_4 and N_2O) from the production and consumption of total and individual plant- and animal-based food from all food-related subsectors, such as land-use change and farmland activities, at local, regional and global scales—which is the overall objective of this study. Such comprehensive and quantitative estimates require a framework that dynamically represents the environmental, management and human drivers of major GHGs while satisfying carbon and nitrogen mass-conservation among plant and livestock production and consumption systems.

Previous efforts have been made to assess GHG emissions from agriculture, forestry and other land use (AFOLU)[3,4], a critical subset of food systems emissions[5–7]. The recent Intergovernmental Panel on Climate Change (IPCC) Special Report on Climate Change and Land (SRCCL)[8] and subsequent work[9] quantified emissions within and beyond the farm gate, the latter referring to emissions caused by food systems that are not covered by AFOLU sectors, such as fertilizer manufacturing, product processing and transportation (Fig. 1), to be in the range of 10,800–19,100 $TgCO_2eq\ yr^{-1}$ for the decade 2008–2017. These estimates combined results from diverse studies on farm-gate agriculture and associated land use[3] with global estimates of emissions along the supply chain up to retail and consumption, each study using a different methodology. The annual assessment of the global carbon budget provides CO_2-only emissions from LUC[3]. In contrast, the Food and Agriculture Organization (FAO) gives CO_2 emissions from forest LUC and peatland degradation[9], but those studies do not cover emissions from changes in agricultural management intensity[9]. Moreover, CH_4 and N_2O emissions from agricultural activities are provided globally by different datasets[10,11], usually based on estimation approaches defined by the IPCC Guidelines[12]. The IPCC AR5 WG3[3] and FAOSTAT[4] quantified regional GHG emissions from subsectors of agriculture and land use. There are also studies focusing on spatially explicit GHG emissions for selected crops[13], emissions of the life cycle of agricultural production[5], such as the FAO GLEAM model to estimate global livestock emissions for 2005[14], and accounting for carbon opportunity costs of agricultural land[15].

This study quantifies CO_2, CH_4 and N_2O emissions from the production and consumption of all plant- and animal-based foods on a grid scale using a consistent unified model–data integration framework. Our approach builds upon and extends the data and methods published in the literature by implementing them into the Integrated Science Assessment Model (ISAM)[16].

Our approach advances the field for three main reasons. First, we have a dynamic representation of environmental drivers, such as climate, CO_2 and of direct human drivers (LUC) using a consistent set of mass-conservative equations and parameters for biophysical and biogeochemical processes to estimate the plant carbon and nitrogen dynamics. In comparison, inventory-based methods, such as those used by the IPCC[12], usually consider environmental factors as static functions[12]. Second, we estimate CO_2 emissions and

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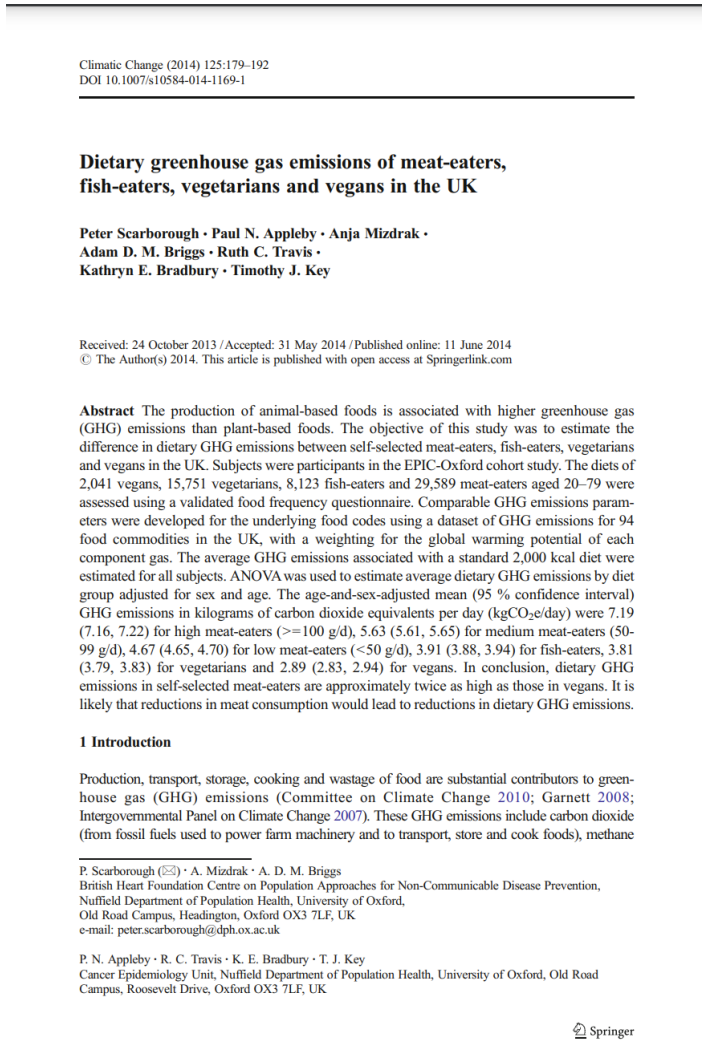
- Study published in the prestigious scientific journal *Nature Food* and posted on the Food and Agriculture Organization (FAO) website: estimated that 57% of GHG emissions from the food system comes from livestock.**[5]**

[5] Xu, X., Sharma, P., Shu, S. *et al.* Global greenhouse gas emissions from animal-based foods are twice those of plant-based foods. *Nature Food* 2, 724–732 (2021). https://doi.org/10.1038/s43016-021-00358-x
Available at: https://www.fao.org/3/cb7033en/cb7033en.pdf

The greenhouse-gas-emitting impact of meat and fat from cattle and goats is (35-64 kg CO_2 equiv per kg of food) beef is vastly higher that any other food (0-5 kg of CO_2 equiv per kg of food).



Climatic Change (2014) 125:179–192
DOI 10.1007/s10584-014-1169-1

Dietary greenhouse gas emissions of meat-eaters, fish-eaters, vegetarians and vegans in the UK

Peter Scarborough · Paul N. Appleby · Anja Mizdrak · Adam D. M. Briggs · Ruth C. Travis · Kathryn E. Bradbury · Timothy J. Key

Received: 24 October 2013 / Accepted: 31 May 2014 / Published online: 11 June 2014

Abstract The production of animal-based foods is associated with higher greenhouse gas (GHG) emissions than plant-based foods. The objective of this study was to estimate the difference in dietary GHG emissions between self-selected meat-eaters, fish-eaters, vegetarians and vegans in the UK. Subjects were participants in the EPIC-Oxford cohort study. The diets of 2,041 vegans, 15,751 vegetarians, 8,123 fish-eaters and 29,589 meat-eaters aged 20–79 were assessed using a validated food frequency questionnaire. Comparable GHG emissions parameters were developed for the underlying food codes using a dataset of GHG emissions for 94 food commodities in the UK, with a weighting for the global warming potential of each component gas. The average GHG emissions associated with a standard 2,000 kcal diet were estimated for all subjects. ANOVA was used to estimate average dietary GHG emissions by diet group adjusted for sex and age. The age-and-sex-adjusted mean (95 % confidence interval) GHG emissions in kilograms of carbon dioxide equivalents per day ($kgCO_2e$/day) were 7.19 (7.16, 7.22) for high meat-eaters (>=100 g/d), 5.63 (5.61, 5.65) for medium meat-eaters (50-99 g/d), 4.67 (4.65, 4.70) for low meat-eaters (<50 g/d), 3.91 (3.88, 3.94) for fish-eaters, 3.81 (3.79, 3.83) for vegetarians and 2.89 (2.83, 2.94) for vegans. In conclusion, dietary GHG emissions in self-selected meat-eaters are approximately twice as high as those in vegans. It is likely that reductions in meat consumption would lead to reductions in dietary GHG emissions.

1 Introduction

Production, transport, storage, cooking and wastage of food are substantial contributors to greenhouse gas (GHG) emissions (Committee on Climate Change 2010; Garnett 2008; Intergovernmental Panel on Climate Change 2007). These GHG emissions include carbon dioxide (from fossil fuels used to power farm machinery and to transport, store and cook foods), methane

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- In one analysis of the greenhouse gas emissions per kilogram of 94 foods sold in the UK, Oxford University researchers found that:
  - meat and fat from cattle and goats emitted 35-64 kg CO2e per kg of food;
  - Coffee, at approximately 10 kgCO2e/kg was a distant second place (however, even this was calculated on the basis of the weight of coffee beans and was reduced to 0.6 kg CO2e per kg of prepared coffee (i.e., a litre of coffee).[3]
  - Other foods ranged from near-zero to 5 kgCO2e per kg of food.[4] (And some of those foods would generally be consumed in very small amounts (such as honey, much smaller than 100 grams in a sitting), further underscoring that beef and goat-related foods are much more GHG-emission-intensive than the rest of the food supply.)

[3] Personal email communication from the principal investigator on April 25, 2022 confirming the greenhouse gas impact of 190 of prepared coffee.

[4] Scarborough P, Appleby PN, Mizdrak A, Briggs AD, Travis RC, Bradbury KE, Key TJ. Dietary greenhouse gas emissions of meat-eaters, fish-eaters, vegetarians and vegans in the UK. *Climate Change*. 2014;125(2):179-192. 2014 Jun 11. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4372775/pdf/10584_2014_Article_1169.pdf

A database of the value of 57,000 multi-ingredient products by nutrition (NutriScore system) and sustainability (greenhouse gas emissions, land use, water stress, and eutrophication, e.g., algal blooms).

Clark M, Springmann M, **Rayner M,** Scarborough P, Hill J, Tilman D, Macdiarmid JI, Fanzo J, Bandy L, Harrington RA. Estimating the environmental impacts of 57,000 food products. Proc Natl Acad Sci U S A. 2022 Aug 16;119(33):e2120584119.

PNAS RESEARCH ARTICLE | ENVIRONMENTAL SCIENCES SUSTAINABILITY SCIENCE OPEN ACCESS

Estimating the environmental impacts of 57,000 food products

Michael Clark[a,b,c,d,1], Marco Springmann[a,b], Mike Rayner[a], Peter Scarborough[a,e], Jason Hill[f], David Tilman[g,h], Jennie I. Macdiarmid[i], Jessica Fanzo[j], Lauren Bandy[k,l], and Richard A. Harrington[a,e]

Edited by B. Turner, Arizona State University, Tempe, AZ; received November 22, 2021; accepted June 21, 2022

Understanding and communicating the environmental impacts of food products is key to enabling transitions to environmentally sustainable food systems [El Bilali and Allahyari, Inf. Process. Agric. 5, 456–464 (2018)]. While previous analyses compared the impacts of food commodities such as fruits, wheat, and beef [Poore and Nemecek, *Science* 360, 987–992 (2018)], most food products contain numerous ingredients. However, because the amount of each ingredient in a product is often known only by the manufacturer, it has been difficult to assess their environmental impacts. Here, we develop an approach to overcome this limitation. It uses prior knowledge from ingredient lists to infer the composition of each ingredient, and then pairs this with environmental databases [Poore and Nemecek *Science* 360, 987–992 (2018); Gephart et al., Nature 597, 360–365 (2021)] to derive estimates of a food product's environmental impact across four indicators: greenhouse gas emissions, land use, water stress, and eutrophication potential. Using the approach on 57,000 products in the United Kingdom and Ireland shows food types have low (e.g., sugary beverages, fruits, breads), to intermediate (e.g., many desserts, pastries), to high environmental impacts (e.g., meat, fish, cheese). Incorporating NutriScore reveals more nutritious products are often more environmentally sustainable but there are exceptions to this trend, and foods consumers may view as substitutable can have markedly different impacts. Sensitivity analyses indicate the approach is robust to uncertainty in ingredient composition and in most cases sourcing. This approach provides a step toward enabling consumers, retailers, and policy makers to make informed decisions on the environmental impacts of food products.

food system sustainability | environmental impact of food | ecolabelling

Significance

One barrier to enabling transitions to more environmentally sustainable food systems is the lack of detailed environmental impact information. We provide an initial approach to overcome this barrier using publicly available information to derive first estimates of the environmental impact of >57,000 food products across four indicators: greenhouse gas emissions, land use, water stress, and eutrophication potential. Pairing it with a measure of nutrition shows a tendency for more nutritious foods to be more environmentally sustainable, and that like-for-like substitutes can have highly variable environmental and nutritional impacts. By estimating the environmental impacts of food products in a standardized way, our approach provides a step to enable informed decision making by end users such as consumers and policy makers.

Transitions to environmentally sustainable food systems are urgently needed (1, 2). If diets and food systems continue to transition along recent trajectories, then international climate and biodiversity targets would be missed in the next several decades, even if impacts from other sectors were rapidly reduced or eliminated (3, 4). These same food system transitions would also lead to increased rates of diet-related diseases such as diabetes, heart disease, stroke, and some cancers (1, 5).

One key step to enabling transitions to an environmentally sustainable food system capable of meeting international environmental targets is to estimate and then communicate the environmental impacts of food products available for purchase (6). This information is increasingly desired. Consumers increasingly want to make decisions on the environmental sustainability of foods (7), food corporations are setting ambitious net zero greenhouse gas targets (8, 9), and food retailers are beginning to implement front-of-pack ecolabels on their food products (10). While previous analyses were a step toward providing environmental impact information on foods, they focused on food commodities such as fruits, red meat, or nuts (11). This leaves a major information gap, as the majority of the tens of thousands of food products for purchase at food retail stores contain multiple ingredients. This means the environmental impacts of most food products are not readily known. There are at least two reasons for this: First, the exact amount of each ingredient and their supply chain in each food product are often considered a trade secret, and thus the quantitative composition of a product's ingredients is not often provided on a food's ingredient list. Second, the sheer number of food products makes the task daunting, as an individual retailer often markets tens of thousands of food products. Although environmental certification labels such as the Roundtable on Sustainable Palm Oil and the Marine Stewardship Council for seafood are an initial step to communicating the environmental impacts of foods, these certifications cover a small set of foods and do not report a quantitative measure of a food's environmental impact. This makes it difficult to compare the sustainability of foods labeled with different environmental certifications and foods not labeled with any certification.

To begin addressing this information barrier, we developed and tested the accuracy of an algorithm that uses publicly available information to derive first estimates of the environmental impacts of food products. Using these results, we investigated trends in

Author contributions: M.C. and R.A.H. conceived the study; M.C., M.S., M.R., P.S., J.H., D.T., J.I.M., J.F., and R.A.H. designed research; R.A.H. and P.S. provided data; M.C. developed the method to estimate a food products environmental impact; M.C. planned the analysis, with contributions from all of the authors; M.C performed the analysis; M.C. and L.B. performed research; M.C., P.S., and D.T. analyzed data; M.C. prepared the initial draft; M.C., M.S., M.R., P.S., J.H., D.T., J.I.M., J.F., L.B., and R.A.H. wrote the paper; and all of the authors edited and revised the manuscript.

The authors declare no competing interest.

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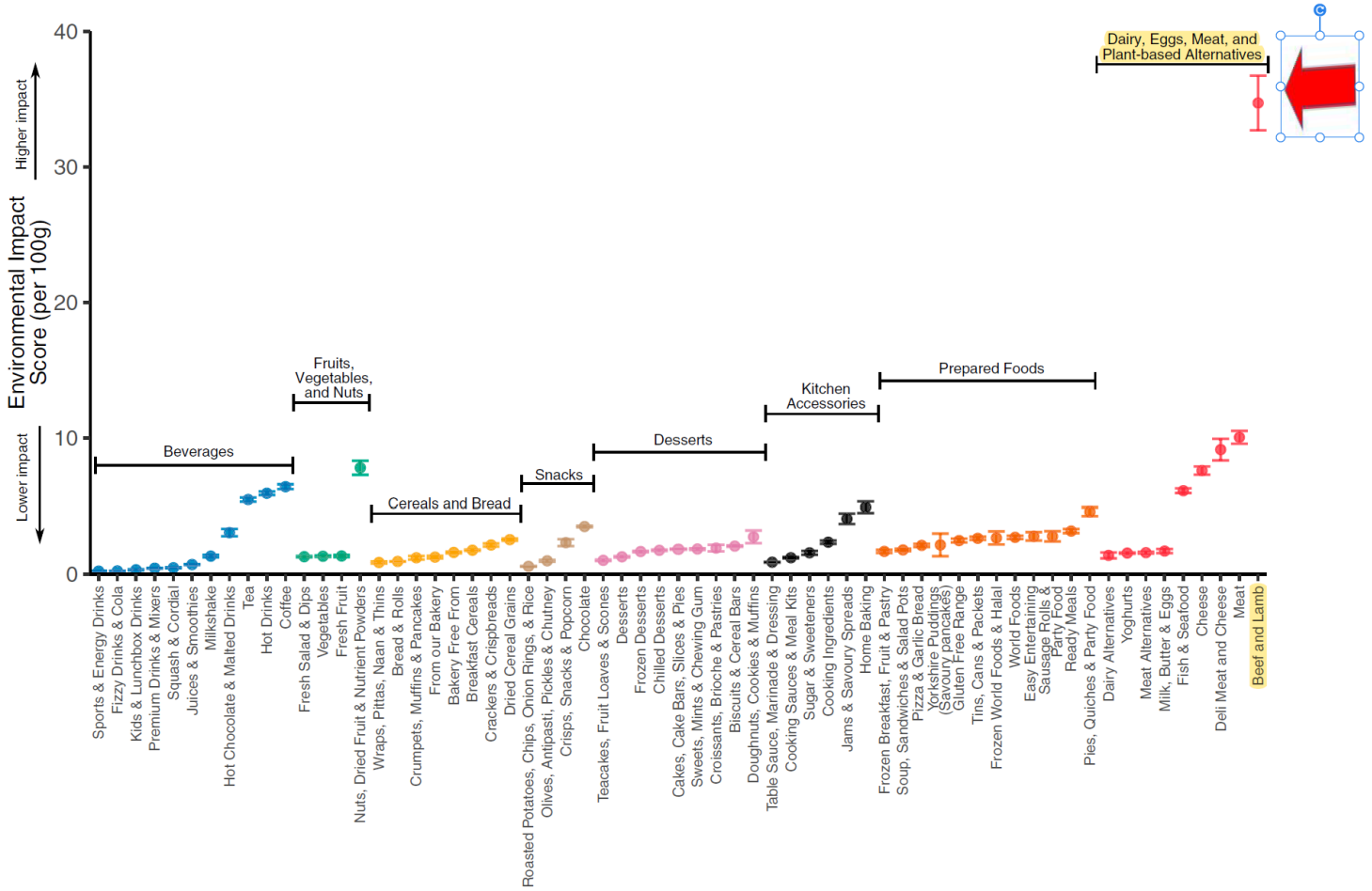

Fig. 3. Environmental impact scores per 100 g of products in Tesco Aisles. Points indicates mean impact of all products categorized to the Aisle, and error bars indicate ±1 SEM. Aisles are colored by food type. Food types are shown from lowest median environmental impact on the left to highest median environmental impact at the right. Aisles within food types are ordered from lowest to highest mean environmental impact score. When plotting, Aisles containing similar products were condensed for visibility and clarity (see *SI Appendix*, Supplementary Information Text). For instance, the Aisles "Fresh Vegetables" and "Frozen Vegetables" were condensed into "Vegetables."

GHG emissions from food can be reduced by 70%-80% by switching to a plant-based diet

PLOS ONE

RESEARCH ARTICLE

The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review

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Abstract

Food production is a major driver of greenhouse gas (GHG) emissions, water and land use, and dietary risk factors are contributors to non-communicable diseases. Shifts in dietary patterns can therefore pctentially provide benefits for both the environment and health. However, there is uncertainty about the magnitude of these impacts, and the dietary changes necessary to achieve them. We systematically review the evidence on changes in GHG emissions, land use, and water use, from shifting current dietary intakes to environmentally sustainable dietary patterns. We find 14 common sustainable dietary patterns across reviewed studies, with reductions as high as 70–80% of GHG emissions and land use, and 50% of water use (with medians of about 20–30% for these indicators across all studies) possible by adopting sustainable dietary patterns. Reductions in environmental footprints were generally proportional to the magnitude of animal-based food restriction. Dietary shifts also yielded modest benefits in all-cause mortality risk. Our review reveals that environmental and health benefits are possible by shifting current Western diets to a variety of more sustainable dietary patterns.

Introduction

There is an urgent need to curb the degradation of natural resources and to limit global warming to less than 2°C, while providing a nutritious diet to a growing and changing world population [1, 2]. Agriculture is responsible for up to 30% of anthropogenic greenhouse gas (GHG) emissions, about 70% of freshwater use, and occupies more than one-third of all potentially cultivatable land [2, 3], with animal-based foods being particularly major contributors to these environmental changes [4]. These impacts present challenges for improving global health and development, by exacerbating climate change, driving biodiversity loss and soil degradation, and increasing freshwater scarcity [2, 5]. At the same time, dietary risk factors are major

- *Fortunately, there is great potential for improvement. A 2016 systematic review found that—of 14 common sustainable dietary patterns across reviewed studies—**reductions in greenhouse gas emissions from food by as much as 70-80% is possible by adopting sustainable dietary patterns and that reductions in environmental footprints were generally proportional to the magnitude of animal-based food restriction**. Dietary shifts modelled also yielded modest benefits in all-cause mortality risk.[9]*

- [9] Aleksandrowicz L, Green R, Joy EJ, Smith P, Haines A. The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review. *Public Library of Science (Public Library of Science One)*. 2016 Nov 3;11(11):e0165797. doi: 10.1371/journal.pone.0165797. PMID: 27812156; PMCID: PMC5094759. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5094759/pdf/pone.0165797.pdf

More estimates of cattle contribution to GHG vary but are high:

1. **Carbon footprint of all beef produced was 18.3 ± 1.7 kg CO2 equivalents (CO2e)/kg carcass weight (CW) with the range in individual production systems being 13 to 25 kg CO2e/kg CW** Rotz CA, Asem-Hiablie S, Dillon J, Bonifacio H. Cradle-to-farm gate environmental footprints of beef cattle production in Kansas, Oklahoma, and Texas. J Anim Sci. 2015 May;93(5):2509-19. doi: 10.2527/jas.2014-8809. PMID: 26020346.
2. **The study determined an overall burden of 24.46 kg CO_2 eq. kg^{-1} of cooked meat. The breeding and fattening phase was the principal source of CO_2 in the production chain, accounting for 86% of the total emissions. (But, methane is prominent during production.)** Vitali A, Grossi G, Martino G, Bernabucci U, Nardone A, Lacetera N. Carbon footprint of organic beef meat from farm to fork: a case study of short supply chain. J Sci Food Agric. 2018 Nov;98(14):5518-5524. doi: 10.1002/jsfa.9098. Epub 2018 Jul 9. PMID: 29691877.
3. **Assumed production of 1 kg Brazilian beef generates 44 kg CO2 equivalent.** de Carvalho AM, Cesar CL, Fisberg RM, Marchioni DM. Excessive meat consumption in Brazil: diet quality and environmental impacts. Public Health Nutr 2013;16:1893–9.
4. **Livestock production accounts for 14.5% of anthropogenic greenhouse gas (GHG) emissions globally, with beef production contributing 41% of the total livestock emissions [**1]. Gerber, P.J.; Steinfeld, H.; Henderson, B.; Mottet, A.; Opio, C.; Dijkman, J.; Falcucci, A.; Tempio, G. Tackling Climate Change through Livestock: A Global Assessment of Emissions and Mitigation Opportunities; Food and Agriculture Organization of the United Nations (FAO): Rome, Italy, 2013.
5. **The food system—all the processes involved in feeding individuals across the globe—has been estimated to be responsible for approximately 25% of global greenhouse gas emissions**; Garnett, T. Plating up solutions. Science 2016, 353, 1202–1204. [PubMed]
6. **Livestock and rice production were found to be the main sources of GHG emissions in Indian agriculture with a country average of 5.65 kg CO_2eq kg^{-1} rice, 45.54 kg CO_2eq kg^{-1} mutton meat, and 2.4 kg CO_2eq kg^{-1} milk. Production of cereals (except rice), fruits and vegetables in India emits comparatively less GHGs with <1 kg CO_2eq kg^{-1} product.** Vetter SH, Sapkota TB, Hillier J, Stirling CM, Macdiarmid JI, Aleksandrowicz L, Green R, Joy EJ, Dangour AD, Smith P. Greenhouse gas emissions from agricultural food production to supply Indian diets: Implications for climate change mitigation. Agric Ecosyst Environ. 2017 Jan 16;237:234-241. doi: 10.1016/j.agee.2016.12.024. PMID: 28148994; PMCID: PMC5268357.
7. **Greenhouse gas emissions resulting from vegan and ovolactovegetarian diets are ~50% and ~35% lower, respectively, than most current omnivore diets.** Fresán U, Sabaté J. Vegetarian Diets: Planetary Health and Its Alignment with Human Health. Adv Nutr. 2019 Nov 1;10(Suppl_4):S380-S388. doi: 10.1093/advances/nmz019. PMID: 31728487; PMCID: PMC6855976.

Efforts to make beef more sustainable don't bring GHG emissions out of the (metaphoric) stratosphere.

1. **Nutrition and feeding approaches may be able to reduce CH_4/ECM by 2.5 to 15%, whereas rumen modifiers have had very little success in terms of sustained CH_4 reductions without compromising milk production. More significant reductions of 15 to 30% CH_4/ECM can be achieved by combinations of genetic and management approaches. [Though these seem small compared to the starting point.]** Knapp JR, Laur GL, Vadas PA, Weiss WP, Tricarico JM. Invited review: Enteric methane in dairy cattle production: quantifying the opportunities and impact of reducing emissions. J Dairy Sci. 2014;97(6):3231-61. doi: 10.3168/jds.2013-7234. Epub 2014 Apr 18. PMID: 24746124.
2. **A 25-yr simulation of their current production system gave an average annual carbon footprint of 10.9±0.6 kg of CO2 equivalent units per kg BW sold, and the energy required to produce that beef (energy footprint) was 26.5±4.5 MJ/kg BW…Compared to 1970, the carbon footprint of the beef produced has decreased [by only] 6%** Rotz CA, Isenberg BJ, Stackhouse-Lawson KR, Pollak EJ. A simulation-based approach for evaluating and comparing the environmental footprints of beef production systems. J Anim Sci. 2013 Nov;91(11):5427-37.
3. **Assessment of a voluntary program to reduce GHG by up to 20% to help achieve an 80% reduction overall.** O'Brien D, Herron J, Andurand J, Caré S, Martinez P, Migliorati L, Moro M, Pirlo G, Dollé JB. LIFE BEEF CARBON: a common framework for quantifying grass and corn based beef farms' carbon footprints. Animal. 2020 Apr;14(4):834-845.
4. **11% reduction in methane:** Ribeiro GO, Oss DB, He Z, Gruninger RJ, Elekwachi C, Forster RJ, Yang W, Beauchemin KA, McAllister TA. Repeated inoculation of cattle rumen with bison rumen contents alters the rumen microbiome and improves nitrogen digestibility in cattle. Sci Rep. 2017 Apr 28;7(1):1276.
5. **Study promotes eating less food overall (and wasting less) instead of reducing beef consumption.** Hyland JJ, Henchion M, McCarthy M, McCarthy SN. The role of meat in strategies to achieve a sustainable diet lower in greenhouse gas emissions: A review. Meat Sci. 2017 Oct;132:189-195.
6. **11% reduction in methane production:** Ribeiro GO, Oss DB, He Z, Gruninger RJ, Elekwachi C, Forster RJ, Yang W, Beauchemin KA, McAllister TA. Repeated inoculation of cattle rumen with bison rumen contents alters the rumen microbiome and improves nitrogen digestibility in cattle. Sci Rep. 2017 Apr 28;7(1):1276.
7. **And ironically:** Davis SR, Spelman RJ, Littlejohn MD. Breeding and Genetics Symposium: Breeding heat tolerant dairy cattle: the case for introgression of the "slick" prolactin receptor variant into dairy breeds. J Anim Sci. 2017 Apr;95(4):1788-1800.

Potential for label warnings is high, especially if they meet the common law standard of adequacy, not Health Canada capitulation

1. **60 of 76 interventions found a positive effect on selection, purchase or consumption**. Potter, C., Bastounis, A., Hartmann-Boyce, J., Stewart, C., Frie, K., Tudor, K., Bianchi, F., Cartwright, E., Cook, B., Rayner, M. & Jebb, S.A., (2021). The Effects of Environmental Sustainability Labels on Selection, Purchase, and Consumption of Food and Drink Products: A Systematic Review. *Environment and Behavior*, 001391652199547 3.
2. **Review of 43 discrete choice experiments (DCEs) with 41,777 participants found a higher willingness to pay more for foods with sustainability label & 3.79 PPP$/kg** (purchasing power parity dollars) (Effect was stronger for meat & dairy compared to seafood, nuts, vegetables, & fruits): Bastounis, A., Buckell, J., Hartmann-Boyce, J., Cook, B., King, S., Potter, C., Bianchi, F., Rayner, M. & Jebb, S. A. (2021). The effectiveness of environmental sustainability labels on "willingness-to-pay" for foods: a systematic review and meta-analysis of discrete choice experiments. *Nutrients*, 13(8), 2677.
3. **"Ecolabeling with a variety of messages and formats was associated with the selection and purchase of more sustainable food products."** Potter C, Bastounis A, Hartmann-Boyce J, Stewart C, Frie K, Tudor K, Bianchi F, Cartwright E, Cook B, Rayner M, Jebb SA. The Effects of Environmental Sustainability Labels on Selection, Purchase, and Consumption of Food and Drink Products: **A Systematic Review**. Environ Behav. 2021 Oct;53(8):891-925. doi: 10.1177/0013916521995473. Epub 2021 Feb 20. PMID: 34456340; PMCID: PMC8384304.

Moving Targets:
Are methane emissions from cattle being underestimated?
What if everyone on the planet ate as much beef as Canadians?

IOP Publishing Environ. Res. Lett. 16 (2021) 063006 https://doi.org/10.1088/1748-9326/ac02ef

ENVIRONMENTAL RESEARCH
LETTERS

TOPICAL REVIEW

Underestimates of methane from intensively raised animals could undermine goals of sustainable development

Matthew N Hayek and Scot M Miller

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Abstract

Greenhouse gas emissions from meat and dairy producti
emissions are typically estimated using inventory-based,
uncertainties that are difficult to quantify. Modeled emis
atmospheric measurements—taken above and downwin
produce 'top-down' emissions estimates. Top-down and
show good agreement when considering global emission
production is predominantly highly intensified with con
emissions may be 39%–90% higher than bottom-up mo
across studies). Animal emissions may grow in the future
developing countries. We examine East and Southeast As
increased meat and dairy production are expected to be
intensive methods. We adjust the share of direct emissior
systems by the intensities derived from US top-down esti
from meat and milk production could reach 1.52 (1.41–1
(13%–29%) higher than previously predicted. Therefore
mitigating emissions in developing countries as is comm

1. Introduction: the role of intensification in sustainable development

Global meat consumption is expected to increase by 50% in the coming decades (FAO 2018a). This increase is primarily driven by rising affluence in developing low- and middle-income countries. Animal agriculture has been reported to represent 15.6% of total annual greenhouse gas (GHG) emissions globally (FAO 2017 using a 100 year global warming potential (GWP_{100}) for non-CO_2 GHGs), with emissions expected to increase in the coming decades.

Limiting GHGs from agriculture is urgent because business-as-usual agricultural growth is likely incompatible with limiting warming below 1.5 °C (Clark *et al* 2020). Reducing emissions from food systems is therefore urgent, even in scenarios in which fossil fuel usage is rapidly phased out.

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Proceedings of the Nutrition Society

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The Nutrition Society Summer Meeting 2015 held at University of Nottingham, Nottingham on 6–9 July 2015

Conference on 'The future of animal products in the human diet: health & environmental concerns' Public Health Nutrition Lecture Concurrent Symposia 1 Challenges of global meat consumption

Socioeconomic and demographic drivers of red and processed meat consumption: implications for health and environmental sustainability

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Red and processed meat (RPM) intake varies widely globally. In some high-income countries (HIC) the last decade has witnessed an overall decline or stabilisation in the consumption of RPM, in contrast to emerging economies where its consumption continues to increase with rising income and rapid urbanisation. The production and consumption of RPM have become major concerns regarding the environmental impacts of livestock in particular, but also because of associations between high RPM consumption and diet-related non-communicable disease. Therefore, it is important to identify socioeconomic and demographic drivers of the consumption of RPM. This paper explores how consumption of RPM differs with age, gender, socioeconomic status and in different global contexts. There are some key socioeconomic and demographic patterns in RPM consumption. Men tend to consume RPM more often and in higher quantities, and there is evidence of a social gradient in HIC, with lower socioeconomic groups consuming RPM more often and in larger quantities. Patterns for consumption with age are less clear cut. It is apparent that consumers in HIC are still consuming high levels of RPM, although the downward shifts in some socioeconomic and demographic groups is encouraging and suggests that strategies could be developed to engage those consumers identified as high RPM consumers. In low- and middle-income countries, RPM consumption is rising, especially in China and Brazil, and in urban areas. Ways of encouraging populations to maintain their traditional healthy eating patterns need to be found in low- and middle-income countries, which will have health, enviromental and economic co-benefits.

Red meat: Socioeconomic factors: Demographic factors: Environmental impact: Health

Meat consumption garners polarising views in terms of its nutritional and environmental impact. Broadly speaking, the concerns fall into two groups: those associated with the production of meat consumed by the world's populations today (and projected increases) and those associated with the health consequences of meat consumption. The drivers of meat consumption are complex and influenced by an inter-related system of factors including culture[1,2], taste[3], cost[4], religion[2,5], gender and socioeconomic status (SES)[6].

Health consequences of red and processed meat consumption

Concerns associated with the health consequences of red and processed meat (RPM) consumption focus in particular on the emerging literature on their health effects on some cancers[7,8], CVD[9,10], obesity[11,12], type 2 diabetes[13] and antibiotic resistance[14]. Some of these negative health consequences depend on the type of meat. Processed meat includes meat products that have been

Abbreviations: GHGE, greenhouse gas emissions; HIC, high-income countries; NDNS, National Diet and Nutrition Survey; RPM, red and processed meat; SES, socioeconomic status.
***Corresponding author**: M. Holdsworth, email michelle.holdsworth@sheffield.ac.uk

- *The risk of these cattle-related GHGs may be even higher now and in the future. A recent study conducted by researchers at Johns Hopkins University and New York University concluded that the* ***conventional method for calculating methane gas contributions by livestock underestimates its impact on climate in High-Income Countries like Canada and the United States to the extent that true methane contributions of meat and dairy production may be 39% to 90% higher.***[7] *Methane accounts for 14% of total global greenhouse gas emissions and is 67 times more potent than CO_2 in temperature change potential after 20 years according to the UN IPCC.*

- *Furthermore, while there are some downward shifts in beef consumption in some demographic groups in high-income countries including North America and Europe, they are still consuming high levels of red and processed meat.* ***Also worrisome, consumption in Low- and Middle-Income Countries is rising, especially in highly populated China and Brazil, and in urban areas.***[8]

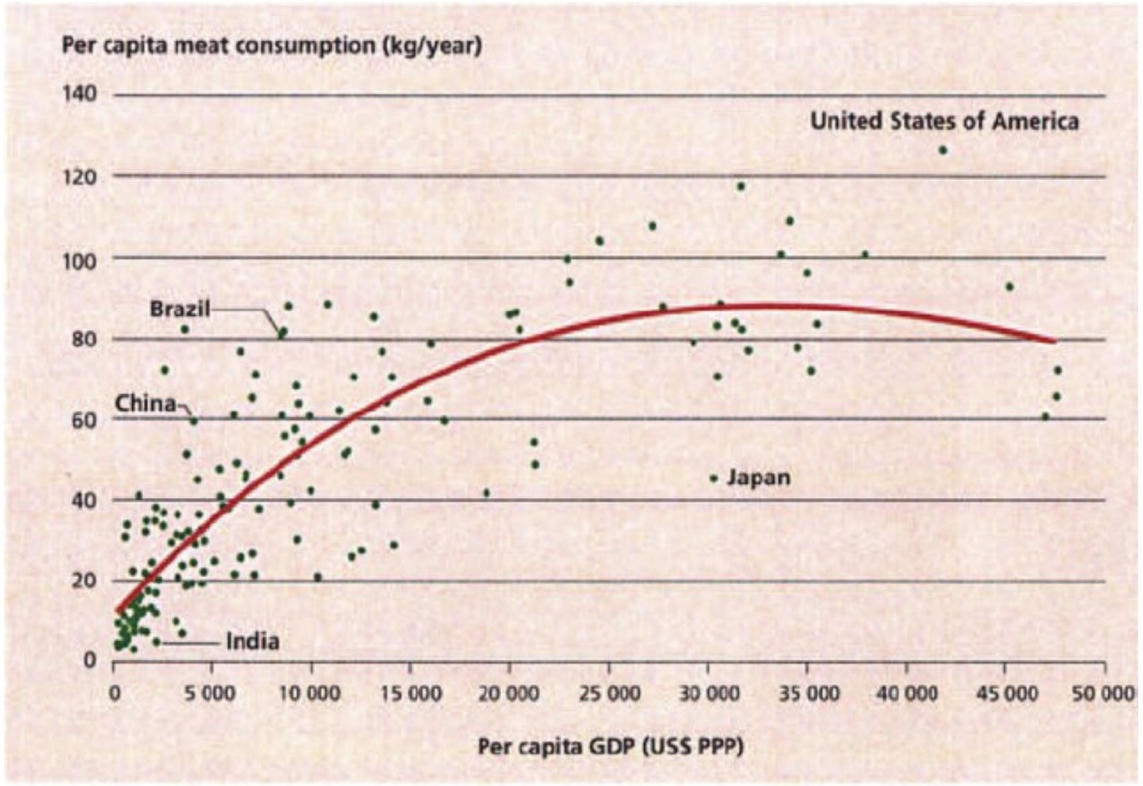
- [7] Matthew N Hayek, Scot M. Miller. Underestimates of methane from intensively-raised animals could undermine goals of sustainable development. *Environmental Research Letters*, 2021; DOI: 10.1088/1748-9326/ac02ef Available at: https://iopscience.iop.org/article/10.1088/1748-9326/ac02ef/pdf

- [8]Clonan A, Roberts KE, Holdsworth M. Socioeconomic and demographic drivers of red and processed meat consumption: implications for health and environmental sustainability. *Proceedings of the Nutrition Society*, Cambridge University Press. 2016 Aug;75(3):367-73. 2016 Mar 29. PMID: 27021468; PMCID: PMC4974628. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4974628/pdf/S0029665116000100a.pdf

GDP/Capita v. meat consumption:

The only thing saving the planet from GHG is sustained poverty and vegetarianism or radically changing meat consumption:

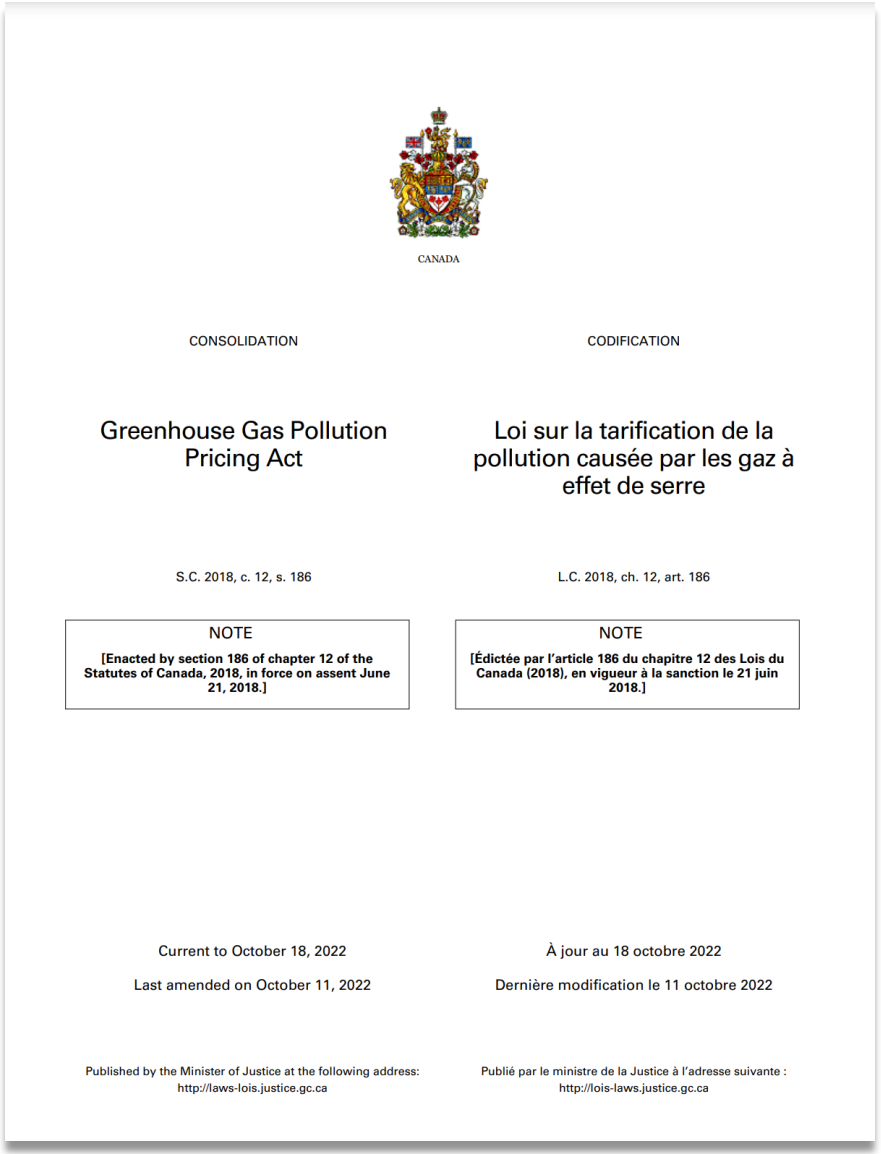
If it is true that the current contribution of cattle to greenhouse gas emissions is comparable to the energy sector (esp. fossil fuels), then the only thing that is preventing cattle from vastly outstripping the energy sector in contributing to a warming planet is poverty in low- and middle-income countries



Greenhouse Gas Pollution Pricing Act, S.C. 2018, c. 12, s. 186

https://laws-lois.justice.gc.ca/PDF/G-11.55.pdf

- **Fossil fuel methane is under the microscope in the polluter-pay principle**
- Natural gas = 90% methane



CANADA

CONSOLIDATION

CODIFICATION

Greenhouse Gas Pollution Pricing Act

Loi sur la tarification de la pollution causée par les gaz à effet de serre

S.C. 2018, c. 12, s. 186

L.C. 2018, ch. 12, art. 186

NOTE

[Enacted by section 186 of chapter 12 of the Statutes of Canada, 2018, in force on assent June 21, 2018.]

NOTE

[Édictée par l'article 186 du chapitre 12 des Lois du Canada (2018), en vigueur à la sanction le 21 juin 2018.]

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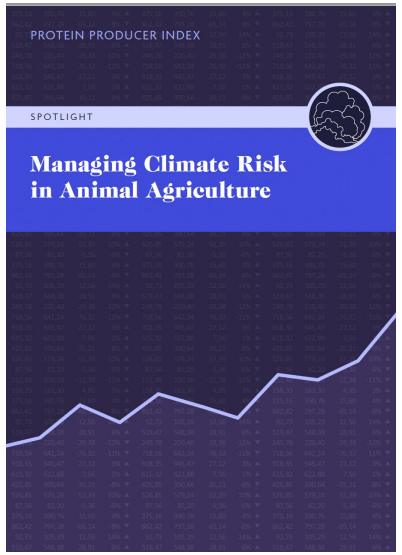
Session on Sustainable Investment of the annual Committee on World Food Security, Oct 12, 2022.

(T at T=59 at: https://www.fao.org/webcast/home/en/item/6018/icode/)

1. Jeremy Coller in a network of Farm Animal Investment Return (FAIRR), $68 trillion asset network of 60 world's largest protein companies (https://www.fairr.org/index/)
2. Need to revise CFS 2014 "Principles for Responsible Investment in Agriculture and Food Systems"
3. Cattle contributes more to GHG than transportation sector
   a) 80% of soy and 60% of corn is fed to 75 billion livestock animals; a fabulously inefficient system
   b) If all food were fed to humans instead of 75 million animals, could feed 3.5 billion people
   c) Recommends repurposing Agricultural support of which $500 billion supports activity that undermines government climate objectives
   d) Investors are becoming aware that a world where people are hungry and the environment in imperilled is risky for investment
   e) Especially pension funds; why prepare for pensions in 2050 if world will be too hot to live in
   f) https://www.fairr.org/index/spotlight/climate-risk-spotlight/

      i. Emissions from global livestock account for 14.5% of all GHGs.
      ii. Livestock is responsible for 44% of methane emissions.
      iii. The Sixth Assessment Report from the Intergovernmental Panel on Climate Change (IPCC) highlighted a 25% increase in emissions from enteric fermentation and manure since the nineties, primarily due to increased livestock numbers.
      iv. A carbon tax on agriculture will be likely in countries that derive considerable economic value from animal agriculture. For example, New Zealand plans to introduce a carbon price on agricultural emissions by 2025 – currently half of the country's total emissions come from agriculture and a quarter from the dairy sector alone.
      v. UK's July 2021 National Food Strategy Report recommends a 30% reduction in meat consumption to meet health, climate and nature commitments.



COP27 (Conference of the Parties, UN Climate Change Conference)

COP27 Presidency Vision

Thematic Days

09 Nov — Finance Day

Finance is the cornerstone for implementing climate actions and scaling up ambition and hence it has been at the heart of the UNFCCC process and the Paris Agreement [illegible] actions. The Glasgow [illegible] also re[illegible]d the centr[illegible] of finance as a catalyst[illegible] pr[illegible]ss on all aspects of the globa[illegible]mate agenda and many Parties [illegible]monstrated the political will to deliver

10 Nov — Science Day

2022 witnesses several landmark science reports from IPCC, UNEP, and other institutions. Ocean science as well as outcomes from Oceans conferences including the 3rd UN Oceans conference are gaining relevance and linkages to the global climate agenda are evident. The science related to the UNCCD and UNCBD, together with Stockholm+50 are also clearly relevant and interlinked with

10 Nov — Youth & Future Generations Day

Ensuring that the voice of Youth and Future Generations is heard loud and clear is one of the objectives of the CoP27 Presidency. Having heard the priorities and concerns of Youth representatives over the past few months, it has been decided to hold a stand-alone day to engage Youth and ensure that their perspectives are taken on board and reflected across all areas of the climate agenda. The day will provide an

11 Nov — Decarbonization Day

Since the adoption of the Paris Agreement and all the way to Glasgow in 2021, several energy intensive sectors and companies have come forward with plans and policies and actions aiming to reduce their carbon footprints and to gradually move towards decarbonization. Technologies are emerging as potential solutions to reduce carbon in the atmosphere. The day would provide an

12 Nov — Adaptation & Agriculture Day

Adaptation and Resilience are of crucial importance to all parties and in particular developing countries. IPCC reports including the latest working group II report highlighted the devastating impacts endured by many countries across the world, and pointed to the fact that we are not on track to deal with current climate impacts nor are we prepared for the [illegible]eme weather events that are increa[illegible]g

14 Nov — Gender Day

The role of women in dealing with all aspects of the climate change challenge is central, crucial and indispensable. Women continue to bear a disproportionate burden from the adverse impacts of climate change, and despite some progress having been made over recent years, the gender perspective needs further work to be fully integrated into the processes of formulating and implementing policies and actions on

14 Nov — Water Day

Water is the source of life and livelihoods. Climate impacts on water and the linkages to wider, cross cutting impacts on development and livelihoods are well documented and substantiated by credible scientific reports and analyses including most recently by the IPCC and numerous other institutions. Discussions at the Water Day will cover all issues related to sustainable water

15 Nov — Ace & Civil Society Day

Climate action requires engagement with, and contributions from all stakeholders. Needless to say, Civil Society is an indispensable partner in the global effort to combat climate change. With this in mind CoP27 will hold a dedicated day to engage Civil Society and to ensure their views and perspectives are integrated in a meaningful manner. Participants will have a platform for sharing best practices and identifying

15 Nov — Energy Day

The Energy Day would deal with all aspects of energy and climate change, including renewable energy and energy transformation, with a specific focus on just transition in the energy sector, and Green hydrogen as a potential energy source for the future. It would also include energy efficiency and ways to manage the envisaged global just transition in energy. Renewable energy, smart grids, energy

16 Nov — Biodiversity Day

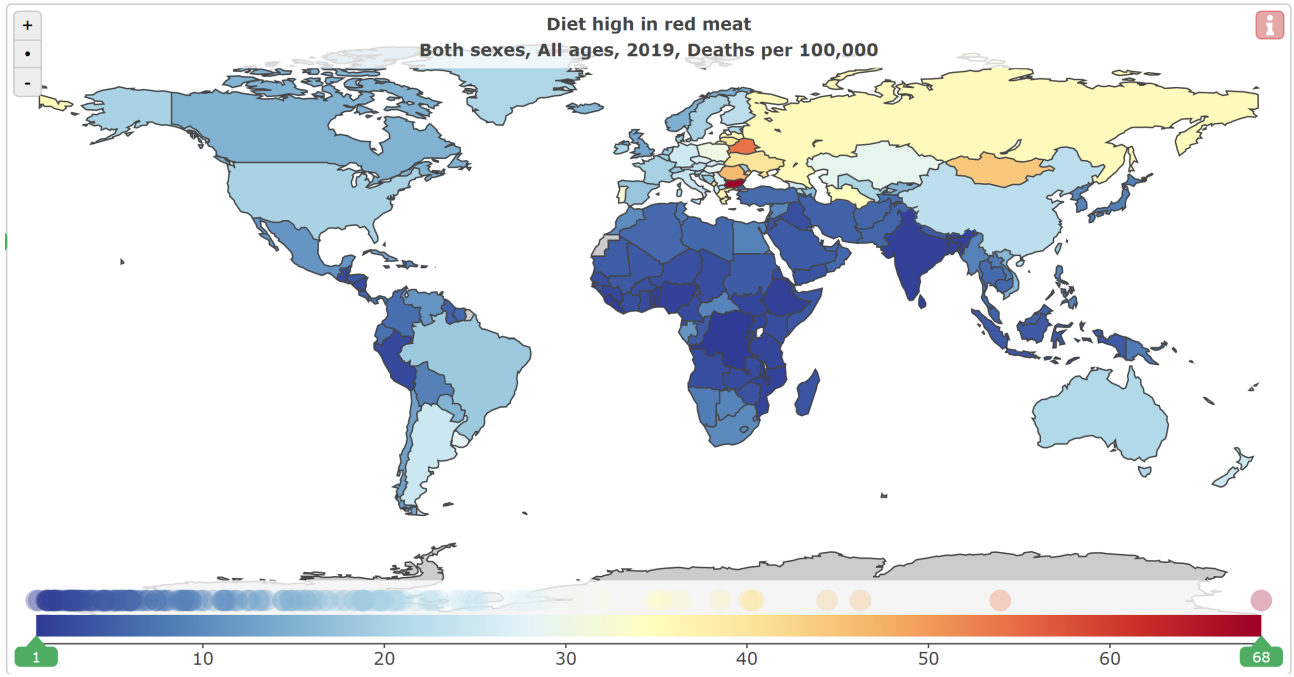
The day would deal with nature and ecosystem-based solutions. It would also allow the discussion about the impacts of climate change on biodiversity and the means to mobilize the global actions towards the challenges to halt biodiversity loss and to reduce the impacts of climate change and pollution. The discussions would also include the impacts of climate change on oceans, endangered species,

17 Nov — Solutions Day

Possible solutions for the broad array of climate change challenges range from the holistic, cross cutting solutions such as greening of national budgets, or sustainable cities, multilevel action and sustainable transport, to sectoral solutions like waste management, alternatives to plastic and green building. More specific solutions emanating from private sector and start-ups bringing creativity and

1. **First ever to start a discussion on agriculture at an event that traditionally focuses on transport and energy.**
2. **However, Coca-Cola is a corporate sponsor**
3. **Framework Convention contains the only "legally binding" right to development and the forthcoming Convention on the Right to Development may help incomes rise in lower-income countries.**

Do not ignore the health impact due to red and processed meat (including beef exempted from Front-of-Pack Nutrition Labelling high saturated fat warnings by July 2022 regulations).



- According to the Institute for Health Metrics and Evaluation diets high in red meat cause approximately 5,436 deaths per year in Canada (approx. 8,000 deaths including processed meat), many times more than the 1,400 deaths attributed to sugar-sweetened beverages.

See: https://vizhub.healthdata.org/gbd-results?params=gbd-api-2019-permalink/b72847d58f35bf590364da3f7e291b83

Additional observations about food labelling generally

1. **Actionable labelling is fundamental to consumer protection.** Product warnings to convey risk & prohibitions on misleading labels are cornerstones of consumer and environmental protection.

2. **Voluntary labelling and non-obvious exemptions systematically mislead consumers.** Misleading labelling is contrary to Codex and the *Food and Drugs Act*, the *Competition Act*, and various provincial consumer protection and business practices statutes.

3. **The moral hazard of voluntary labelling.** Sellers have incentives to abstain from voluntary FOPNL systems that improve health by reducing sales. Industries that are involved in designing labelling systems have incentives to favourably portray their products (e.g., medium ground beef getting 3.5 of 5 stars in the Australian Healthy Stars system).

4. **Focus on key defects that cannot be effectively addressed in other ways (e.g., pesticide residue limits, water use regulation, child labour laws, animal welfare laws).** Some labelling approaches (e.g., WHO model, one Oxford model, OMNI, include so many other sustainability factors they seriously dilute the impact on greenhouse gas emissions they are unlikely to have an impact on planet-warming many of which are designed to be dealt with in other ways (e.g., human rights legislation, pesticide regulations, water-management laws).

The common law standard for the duty to warn probably would apply to climate change warnings on food labels.

Table 1. ***The*** *Buchan* ***Standard for Adequacy of Warnings***

1. Warnings must be communicated clearly and understandably.
2. Warnings must be communicated in a manner calculated to inform the user of the nature of the risk and extent of the danger.
3. Warnings must be communicated in terms commensurate with the gravity of the potential hazard.
4. Warnings must be explicit.
5. Warnings should not be neutralized or negated by collateral efforts on the part of the manufacturer.
6. There is a duty to keep abreast of scientific developments.
7. There is a continuous duty to warn consumers of new risks.

Excerpted from: Jacob J Shelley, A Reflection on the Duty to Warn After Létourneau v JTI-MacDonald: A Future for Obesity Litigation in Canada?, 2021 14-2 *McGill Journal of Law and Health* 89, 2021 CanLIIDocs 13216, https://canlii.ca/t/tsl0 Létourneau c. JTI-MacDonald Corp., 2015 QCCS 2382 (CanLII), <https://canlii.ca/t/gjbt9>, consulté le 2022-10-31; and Buchan v. Ortho Pharmaceutical (Canada) Ltd., 1986 CanLII 114 (ON CA), <https://canlii.ca/t/1npp9>, retrieved on 2022-10-31; affirmed by Hollis v. Dow Corning Corp., 1995 CanLII 55 (SCC), [1995], 4 SCR 634, <https://canlii.ca/t/1frdr>, retrieved on 2022-11-01.

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