# Diets for a Better Future:

Rebooting and Reimagining Healthy and Sustainable Food Systems in the G20

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**Diets for a Better Future** investigates current food consumption patterns and the efficacy of national dietary guidelines in G20 countries compared to the Planetary Health Diet. It also explores the potential for reducing greenhouse gas emissions by shifting toward more healthy and sustainable diets and how this could lead to a more equitable distribution of the global "carbon budget" for food. The modeling used in this report is part of an academic research paper titled *The healthiness and sustainability of national and global food-based dietary guidelines* (Springmann et al. 2020).

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# Foreword

**Dr. Jonathan Foley**
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**The future of the food system will be central in shaping the future of our planet and our civilization.**

First, let's consider the environmental impacts of food. Most people don't realize it, but our food system and agricultural practices are major drivers of environmental degradation worldwide. Already, agricultural land use dominates about 40% of the Earth's land surface and has been the principle driver of tropical deforestation, habitat loss and degradation, and global biodiversity loss. Agriculture is also the biggest consumer, and polluter, of the world's water resources. Lakes, aquifers, rivers, and even coastal oceans around the world have been disrupted by human activities, notably food production. And the food system contributes about 25% of the world's greenhouse gas emissions, roughly comparable to the emissions resulting from the world's production of electricity. In short, nothing else we do has come close to how food, agriculture, and land use are causing global environmental harm. **Without major changes, our food system will continue to push Earth well beyond its planetary boundaries.**

Beyond these environmental concerns, the world's current food system also contributes to significant human failures. On the one hand, a sizable fraction of the world still faces crippling food insecurity and under-nutrition, while on the other hand, hundreds of millions of people face serious health challenges – including obesity, diabetes, and heart disease – linked to unhealthy diets.

To address these environmental *and* social challenges, we must reboot and reimagine our global food system. Numerous changes to the food system are needed, including protecting intact ecosystems, improving the sustainability of our farming practices, and addressing the tremendous levels of waste in the food system.

But there is one crucial factor that can *simultaneously* improve our health, our food security, and our environment at the same time – namely, changing our diets.

Our dietary choices, especially how much conventionally-produced red meat and dairy products we consume, can drive health and environmental outcomes across the entire food system. Simply put, reducing the consumption of some foods, while increasing the consumption of others, could have tremendous benefits to the global environment and to human health.

This pioneering study by EAT examines how national dietary guidelines in G20 countries need to be shifted to improve human health *and* environmental outcomes in the food system. The results strongly indicate the need to change our views on diet and consider both the human health *and* environmental sustainability implications while setting national food policies. This study helps illustrate ways to build a better food system – promoting improved food security and human health while reducing environmental impacts.

**In a world where climate change, biodiversity loss, food security, and diet-related illnesses are major concerns, changing diets may be one of the single most effective things we can do to build a better future. And this study is a powerful reminder of how we can do it.**

# Critical Points

## 1

**Dietary choices in G20 countries are destroying the planet.** Global adoption of current G20 food consumption patterns by 2050 would exceed the planetary boundary for food-related GHG emissions by 263%. This would require between one to seven Earths to support.

## 2

**Food is critical in our fight against climate change and requires leadership from the G20.** The food we choose to eat, how much is lost or wasted and how it is produced will determine whether we meet the Paris Agreement and Sustainable Development Goals.

## 3

**National dietary guidelines are an opportunity for policymakers to support coherent food and agriculture priorities aligned with the Paris Agreement and Sustainable Development Goals.** The national dietary guidelines of G20 countries  are inconsistent in their dietary recommendations, and few integrate both health and environmental sustainability.

## 4

**A shift toward healthy and sustainable diets should be a priority in all G20 countries.** Consumption of less healthy and less sustainably produced “lose-lose” foods is too high in most G20 countries, while intake of healthier “win-win” foods is consistently too low.

## 5

**Food-related per-capita emissions in G20 countries as a whole need to be approximately halved by 2050.** Doing so would ensure we can feed 10 billion people healthy diets within planetary boundaries, and enable a more equitable global distribution of food-related GHG emissions.

## 6

**Following the current national dietary guidelines of the G20 countries will not ensure global warming stays below 1.5°C.** Total food-related GHG emissions in G20 countries currently account for approximately 75% of the carbon budget for food, while adopting a healthy flexitarian diet would reduce this to approximately 40%.

## 7

**The G20 countries have a variety of rich and vibrant diets and culinary traditions that require different approaches and scales of intervention to achieve healthy diets within planetary boundaries.** Some countries would require more ambitious reductions in per-capita food-related GHG emissions while others may require a slight increase.

# Executive Summary

**The food we choose to eat,** how much is lost or wasted, and how it is produced will determine whether or not we meet the Paris Agreement and Sustainable Development Goals (SDGs). Food systems must transition from being a net source of GHG emissions to a net sink. Shifting toward healthy flexitarian diets is central to this goal. Despite this, food consumption is rarely considered as a solution by countries in meeting climate targets outlined by their Nationally Determined Contributions (NDCs). A large body of evidence has shown that a diet rich in healthy plant-based foods and with fewer animal source foods (i.e. up to five servings of animal source foods per week) confers both improved health and environmental benefits. Overall, this literature indicates that such diets are "win-win" in that they are good for both people and planet.

The EAT-*Lancet* Commission on Food, Planet, Health brought all of this evidence together and proposed scientific targets for healthy diets and sustainable food systems. The Commission concluded that achieving healthy diets from sustainable food systems for 10 billion people by 2050 is possible but only with a significant reduction of animal source foods in some countries (mainly G20 countries) and universal increase in healthy plant-based foods in our diets. Hence, shifting towards flexitarian diets, such as the Planetary Health Diet, composed predominantly of healthy plant-based foods, can optimize human health while reducing environmental impacts. Despite this, most food consumption patterns in G20 countries are not aligned with those of a healthy flexitarian diet and most national dietary guidelines (NDGs) are not ambitious enough to bring food systems within planetary boundaries, including limiting global warming to 1.5°C. This is important because NDGs are a necessary component of food policy and an essential first step to promoting healthy eating habits in a country often through educational programs or public awareness campaigns. If NDGs lack ambition or are incompatible with the latest science on human health and environmental sustainability, then this could influence national level food policy and individual food consumption.

Although there are significant differences in food consumption—within and between G20 countries—reflecting each country's distinct food traditions and socio-economic circumstances, there is a common trend towards increased prevalence of unhealthy diets, characterized by overconsumption of red meat, dairy, sugar, and highly processed foods and under consumption of healthy foods. This is leading to increasing rates of non-communicable diseases (NCDs) in these countries and at the global level, unhealthy diets now pose a greater risk to morbidity and mortality than does unsafe sex, and alcohol, drug, and tobacco use combined. If these consumption patterns are adopted globally over the coming decades, GHG emissions from food production will nearly double by 2050, largely surpassing the "carbon budget" of 5.0 Gt $CO_2$eq for food. These projected consumption trends could trigger irreversible global "tipping-points" leading to catastrophic environmental damage and jeopardizing human civilization as we know it.

At the same time much of the world's population still faces burdens of undernutrition, with more than 820 million people having insufficient food and many more consuming low-quality diets. Given all of this, we need an unprecedented effort to shift dietary patterns towards healthy and sustainable food consumption and a global commitment to reverse trends toward unhealthy diets in the rest of the world. Transitions to healthy diets would decrease total global food-related GHG emissions and enable more equitable distribution of these emissions within planetary boundaries. This would ensure that all countries can adequately address all forms of malnutrition while leaving our children a thriving and healthy planet. Without leadership by the G20, the world cannot achieve this critically important goal.

# Food is Fundamental

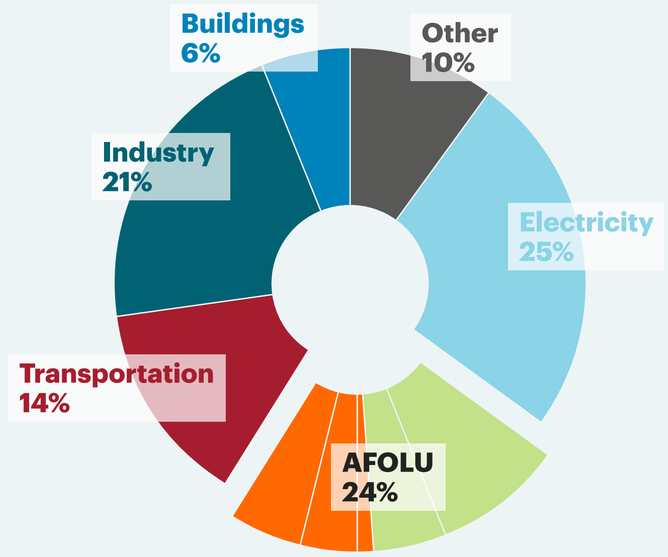
**Global food production** is the single largest human pressure on Earth, threatening local ecosystems, driving a sixth mass extinction of species, and impacting the stability of the entire Earth system.[1,2,3] Feeding and producing food for our current population of 7.7 billion people accounts for approximately 12.5 Gt $CO_2$eq or 24% of annual greenhouse gas (GHG) emissions (**see Figure 1**). Of this, 5.6 Gt $CO_2$eq come mainly from livestock production and rotting food waste, while 6.9 Gt $CO_2$eq come from rice production, agriculture practices, fertilizer use, land conversion and deforestation mainly for agriculture.[1,4] Despite the central role of food consumption and production as a major driver in the climate and biodiversity crises, food has so far not been considered central to global policy agendas such as the Paris Agreement, Sustainable Development Goals (SDGs), or Convention on Biological Diversity.

Although global food production of calories has kept pace with population growth, approximately 820 million people still lack sufficient food and many more consume an unhealthy diet that contributes to premature death and morbidity.[5,6] Globally, obesity rates are soaring, as nearly 800 million people are considered obese (more than 2 billion when considering both overweight and obese), and 40 million children under the age of five are overweight.[7] This is mainly driven by a shift to less healthy foods, including diets increasingly dominated by refined carbohydrates, sugars, and red and processed meats. This unhealthy dietary pattern is leading to increasing rates of non-communicable diseases (NCDs) and unhealthy diets now pose a greater risk to morbidity and mortality than does unsafe sex, and alcohol, drug, and tobacco use combined.[8] Globally, this double burden of malnutrition is unequally distributed with many G20 countries largely suffering from high rates of overweight and obesity (e.g. 72% of Americans, Australia 63%) while many non G20 countries suffering from undernutrition, with global hunger rates increasing in recent years.[9,10]

## Moving from incremental to exponential action

There is a growing body of scientific evidence for the need to keep global warming to well below 2°C, aiming for 1.5°C.[1,11,12] These are the global temperature limits necessary to maintain the stability of the Earth system and reduce catastrophic impacts to human civilization. Coupled with this evidence are rapidly growing bottom-up movements demanding action on the Paris Agreement and the biodiversity crisis.[13] However, any actions taken on the climate emergency must move from incremental to exponential following a power law related to GHG emissions, termed the Carbon Law.[4,14] This roadmap outlines the exponential rate of change necessary to reduce emissions fast enough to limit warming to 1.5°C. According to the Carbon Law, emissions need to peak in 2020 and halve every decade with decarbonization happening no later than 2050 (**Figure 2**).

### Global Emissions by Sector




| Agriculture | 10% |
|---|---|
| Methane: Animals | 5% |
| Nitrous Oxide: Fertilizers & Manure | 4% |
| Methane: Rice | 1% |

| Forestry and Land Use | 14% |
|---|---|
| Land Use Change, Forestry | 9% |
| Other Food, Agriculture, Land Use | 5% |

**Figure 1.**
*Agriculture, Forestry, and Land Use (AFOLU) account for nearly 24% of global GHG emissions. Without adequately integrating food consumption and production into national level decision-making, there is a low chance of achieving international policy agendas like the Paris Agreement and Sustainable Development Goals (SDGs). Agriculture, Forestry, and Land Use are commonly grouped into a single sector called AFOLU but have been separated into two sectors here to highlight the GHG gases (i.e. methane and nitrous oxide) we focus on in this report.* ***Data: IPCC WG3 FAR Image: Jonathan Foley, Drawdown.org.***

## Roadmap to 1.5°C

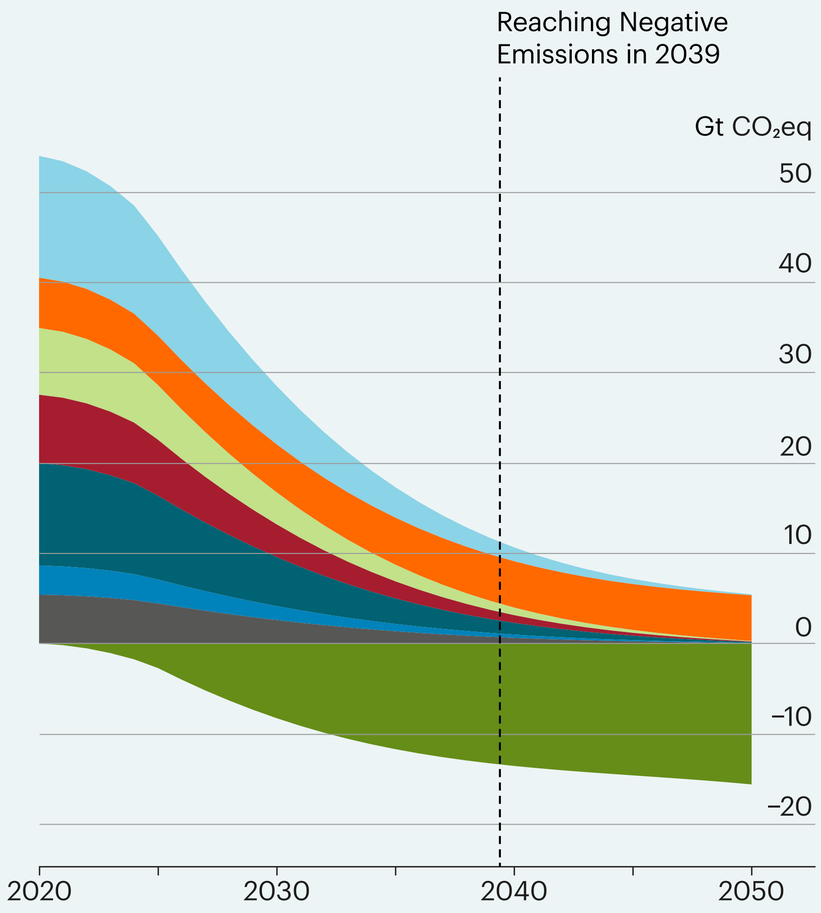



**Figure 2.**
*Total global emissions projections, showing the exponential decreases necessary to keep global warming to 1.5°C, across major contributing sectors. The orange and light green sectors are emissions from agriculture, forestry and land use mainly for food production (e.g. clearing of tropical forests for livestock and agriculture). Emissions in all sectors, except for agriculture, must peak in 2020 and rapidly decrease, halving every decade until 2050. Emissions from agriculture must reduce to at least 5.0 Gt $CO_2$eq, but reducing even further below this boundary may be difficult to achieve while feeding 10 billion people by 2050. We offer the term "carbon budget" to describe this 5.0 Gt $CO_2$eq planetary boundary for food. In addition to rapid decarbonization, we must also begin storing massive amounts of carbon dioxide in nature based sinks (dark green in figure).* ***Figure adapted from Willett, Rockstrom, Loken, et al. (2019).***[2]

### A 'carbon budget' for food

Of the sectors outlined in Figures 1 and 2, food is unique. Unique in that it is not feasible to reduce emissions to near zero by 2050. This is due to the fact that the biological processes that produce emissions for food production are intrinsic to crop (i.e. nitrous oxide from fertilizer use) and livestock production (i.e. methane from ruminants – **see Figure 1**) and therefore some amount of GHGs will always be generated by food production practices. While we can and must set high ambitions for anthropogenic GHG emissions reductions, we cannot expect to fully eliminate all GHG emissions (i.e methane and nitrous oxide) related to food production.[2] Given this, the EAT-*Lancet* Commission proposed a scientific target for GHG emissions from food production, which they assessed as both necessary and hard to reduce further to achieve both healthy diets for nearly 10 billion people and the Paris Agreement by 2050. The Commission set the upper boundary of emissions from food at 5.0 Gt $CO_2$eq, which we also adopt as the boundary or maximum allowable "carbon budget" in this analysis.

**Food is also unique in that it can go from being a large part of the climate change problem to being one of the most important solutions by driving change in the agriculture, forestry and land-use sector.**

This is possible because these natural systems are both sources and very large sinks for carbon (see Figure 2). With changes in how and where we produce food and what we eat, we can both reduce GHG emissions and use forests, croplands, pastures and peatlands to sequester carbon.[1,2]

However, current food consumption trajectories and estimated growth of another 2 billion people on the planet by 2050 will largely exceed food's maximum allowable "carbon budget". Behaviorial changes associated with rising incomes and urbanization are driving a global dietary transition in which traditional diets are being replaced by more homogenous diets higher in animal source foods.[8] If this trend is not broken and reversed, emissions from food production will nearly double by 2050[2] (Figure 3).

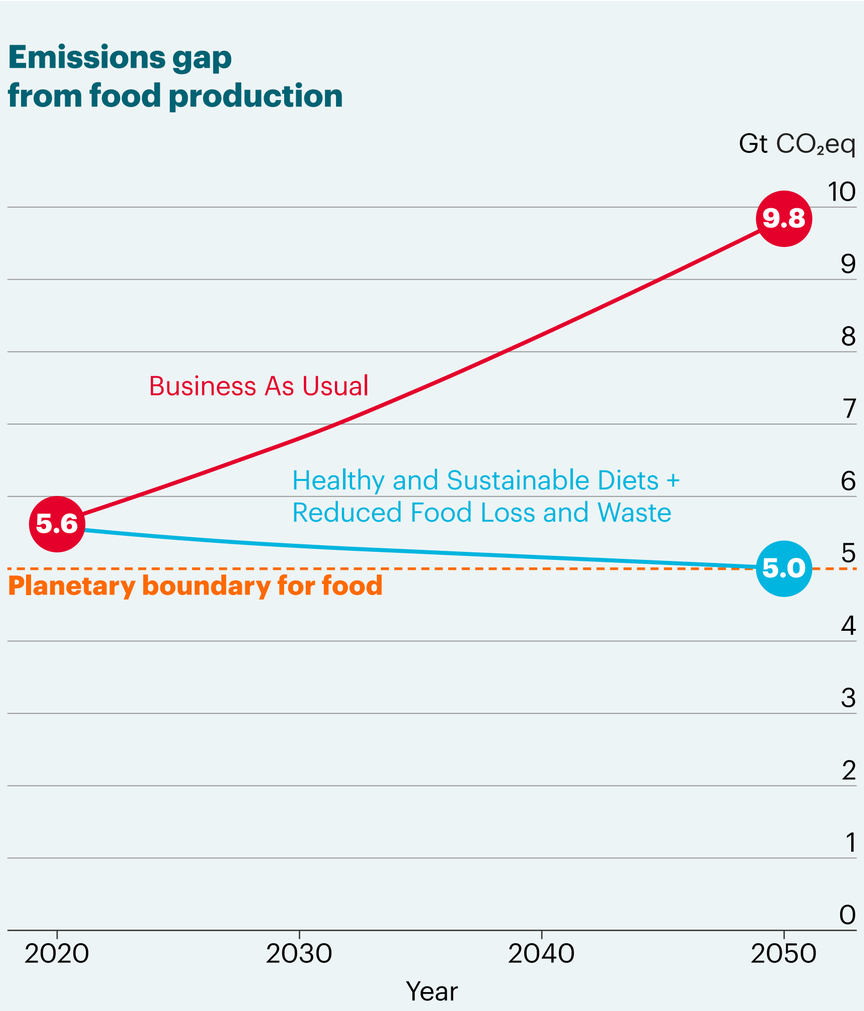



**Figure 3.**
*If we follow a business as usual approach, GHG emissions from food production are projected to rise to 9.8 Gt $CO_2$eq. A shift toward healthy flexitarian diets (such as the Planetary Health Diet) in G20 countries and halving in food loss and waste can help prevent this gap. To achieve the Paris Agreement, global emissions from food consumption must not be greater than 5.0 Gt $CO^2$eq by 2050.* ***Figure adapted from Exponential Roadmap (2019).***[4]

## Health and environmental impacts of various foods

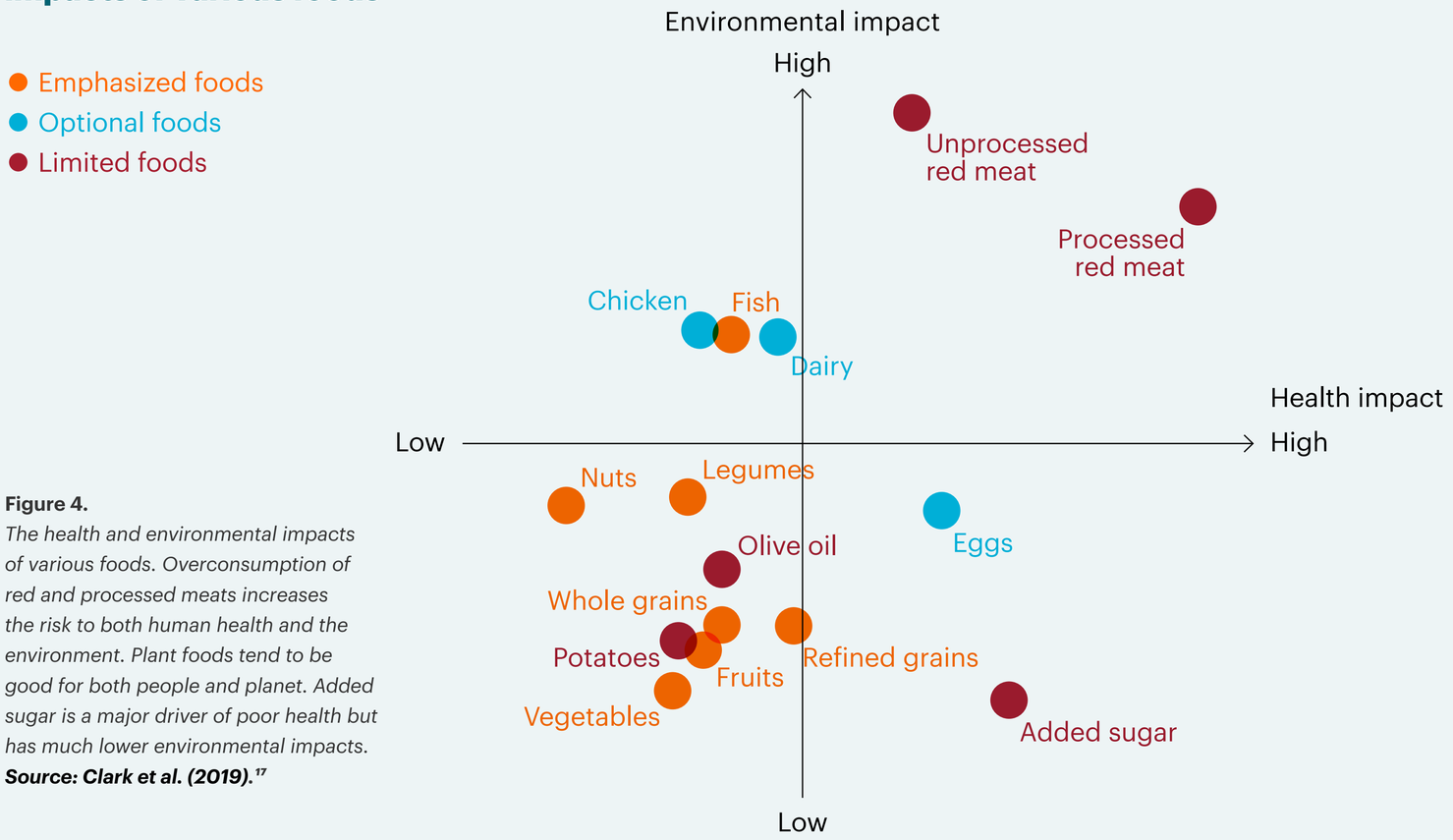



**Figure 4.**
*The health and environmental impacts of various foods. Overconsumption of red and processed meats increases the risk to both human health and the environment. Plant foods tend to be good for both people and planet. Added sugar is a major driver of poor health but has much lower environmental impacts.*
***Source: Clark et al. (2019).***[17]

### Some foods are "win-win" others are "lose-lose"

A large body of evidence has demonstrated that overconsumption of red and processed meat, saturated fats, and (to a lesser degree) dairy products, are linked to increased risk for certain types of preventable diseases (e.g. cancers and heart disease).[2] In tandem, a large body of work has emerged on the environmental impacts of various diets, with most studies concluding that a diet rich in healthy plant-based foods and with fewer animal source foods confers both improved health and environmental benefits.[15,16,17] Overall, this literature indicates that such diets are “win-win” in that they are good for both people and planet (Figure 4). The EAT-*Lancet* Commission on Food, Planet, Health brought all of this evidence together and proposed scientific targets for healthy diets and sustainable food systems and concluded that achieving healthy diets from sustainable food systems for 10 billion people by 2050 is possible, but only through an unprecedented global transformation of the food system that includes a significant reduction of animal source foods in countries where they are over consumed, along with a halving of food loss and waste and significant changes in food production practices.

# Guiding the Food Choices We Make

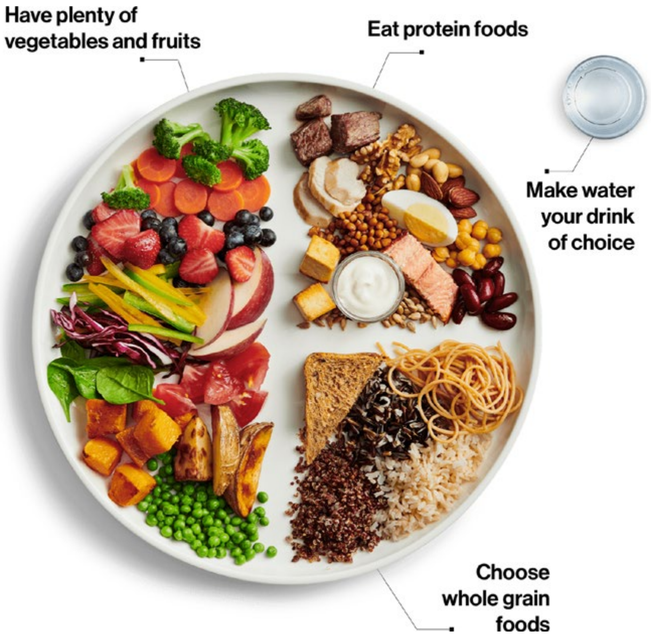
**National dietary guidelines** (NDGs) are key tools for changing food systems. NDGs are public, government-endorsed documents that are intended to provide generalizable recommendations and advice on healthy diets and lifestyles.[18] They are a key component of public health policy and an essential first step to promoting healthy eating habits in a country, often through educational programs or public awareness campaigns.[19] Typically, NDGs set guidance on the individual foods people should be eating to maintain and improve good health and can provide either quantitative recommendations by food groups or more general qualitative advice of overall diet.[20] Given that NDGs are a key component of national public health policy and used to educate the general public, aligning NDGs with the latest scientific evidence on human health is critical for promoting public health. Additionally, these guidelines are increasingly understood as an important opportunity to flag the climate implications of dietary choices.

## The current state of National Dietary Guidelines

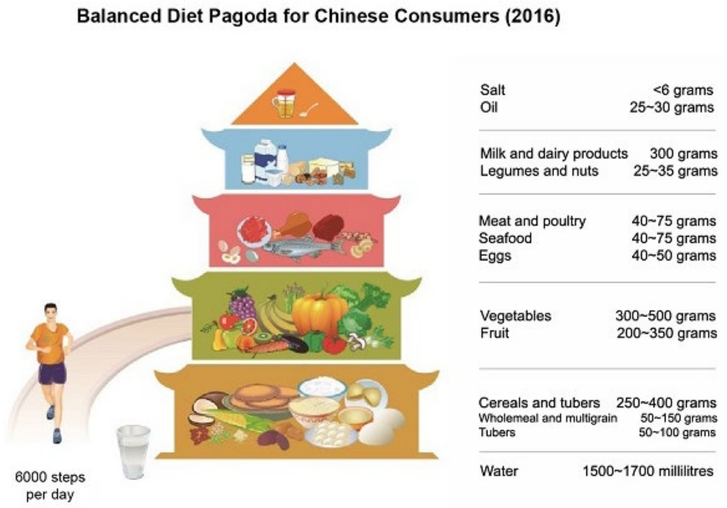
Globally, more than 100 countries have developed or are developing NDGs.[20] They are, however largely absent for low- and middle-income countries.[8] Broadly speaking, NDGs encourage higher consumption of fruits and vegetables and lower consumption of sugar and salt – trends that are highly compatible with international guidelines and healthy flexitarian diets such as the Planetary Health Diet. Less than 25% of NDGs recommend reducing or moderating meat intake and few countries make specific recommendations for whole grain consumption.[8]

Many NDGs, however, are taking significant steps to promote healthy plant-based diets. Canada recently launched a food guide (see Figure 5) with the words "Eat Well. Live Well." across the top of their guidelines. Their recommendations are to: have plenty of vegetables and fruits (half of the plate), eat protein foods (quarter of the plate), choose whole-grain foods (quarter of the plate), and make water the drink of choice. The "guide emphasizes getting protein from plant-based sources such as beans, lentils and nuts, rather than always choosing animal-based foods such as milk, meat and poultry."[21]
The new Chinese guidelines recommend to "eat a variety of foods, with cereals as the staple; balance eating and exercise to maintain a healthy body weight; consume plenty of vegetables, milk, and soybeans; and consume an appropriate amount of fish, poultry, eggs, and lean meat."[20]

### National Dietary Guidelines of Canada




### National Dietary Guidelines of China



Many other countries offer similar recommendations, all of which are encouraging signs that NDGs are becoming more closely aligned with the latest science on foods that optimize human health.

Some NDGs offer only qualitative recommendations* that are broadly in line with WHO guidance on healthy diets.[22] This approach can make monitoring progress toward meeting targets more difficult. This also applies to the WHO dietary recommendations which provide few concrete intake values or ranges and do not provide quantitative recommendations on red meat, dairy and sugar consumption.[22] Quantified targets can be useful because they can help ensure NDGs are in line with the latest science on foods that optimize human health. In addition, targets assist with monitoring global and national progress toward health and environmental outcomes including the SDGs, Paris Agreement, and the Global NCD Action Plan.[23]

For those countries that do offer quantified recommendations, there is a wide range of daily intake values for distinct food groups. An analysis[24] of NDGs for G20 countries used in this report found, for example, that recommended levels of red meat consumption varied from 35 g/day to approximately 70 g/day, vegetable consumption from approximately 200 g/day to 400 g/day, and dairy consumption (in milk equivalents) from 200 g/day to over 1000 g/day. This wide variation of recommended intake levels can have large impacts on both human health and environmental sustainability.

## National Dietary Guidelines of Australia


## National Dietary Guidelines of Indonesia


**Some countries may decide to not offer quantitative targets because these will vary substantially depending on body size and physical activity. For this analysis, however, quantified targets were needed to compare consumption patterns and GHG emissions and every effort was made to translate all targets into comparable quantified targets. When this was not possible (e.g. Canada), then NDG targets were aligned with current consumption levels. This assumption could have an impact in accurately assessing NDG targets in countries that do not offer quantified targets.*

**Figure 5.**
*Visual representations of the dietary guidelines in Canada, China, Australia, and Indonesia demonstrating a breadth of recommendations and communication styles.* ***Source FAO (2019).***[20]

## Integrating environmental sustainability into NDGs

Very few countries explicitly mention or incorporate environmental sustainability into NDGs.[8,19] Sweden, Brazil, Germany, and Canada are a few of the countries that have mentioned climate considerations and the relative impact of various food groups. Of these countries, Sweden and Brazil have the most embedded message on environmental sustainability, yet their NDGs are not necessarily more climate-friendly than other NDGs. Integrating the health and climate action messages is critical to offer citizens a full understanding of the implications of their diet, given that certain foods, such as red meat and dairy, have much higher climate impacts (see Figure 4). Countries that recommend higher levels of red meat and dairy consumption may also be inadvertently causing increased levels of GHG emissions. Even slightly higher recommendations in red meat (from 100 g/week to 300 g/week) and dairy consumption (from 250g/day to 500g/day) will increase GHG emissions from the agricultural sector by nearly 50%, well above the planetary boundary for food.[2]

## Are consumption patterns in G20 countries aligned with their NDGs?


**Figure 6.**
*G20 countries current consumption patterns vs. their NDG recommendations. No countries currently meet at least three of the recommendations in their NDGs, while a few meet at last one or two recommendations.* ***Data from Springmann et al. (2020).***[24]

## Need for consensus on what is healthy and sustainable

The differences in NDGs outlined above highlights the imperative for broader scientific consensus on what defines a healthy and sustainable diet to help ensure that both the Paris Agreement and SDGs are achieved. A healthy diet should optimize human health while a sustainable diet should be produced within the planetary boundaries. For the analysis completed in this report[24] we are adopting the Planetary Health Diet put forth by the EAT-*Lancet* Commission and using the global GHG boundary of 5 Gt $CO_2$eq for food production, which is consistent with keeping temperature increases to 1.5°C (**Figure 7**). We adopt this diet because, when considering the ranges of this diet outlined in **Figure 7**, this healthy flexitarian diet can be adapted to the multitude of culinary traditions around the world. In addition, adoption of the Planetary Health Diet would also help to alleviate all forms of malnutrition.

The food groups in the Planetary Health Diet, which is based on a 2500 kcal/day diet, can be divided into three categories: emphasized foods which should form the bulk of one's diet; limited foods which could form a moderate portion of one's diet and; optional foods which are not necessary and if consumed should form the smallest portion of one's diet. The food groups in each category are listed below. For more information on the health impacts of each food, please see the EAT-*Lancet* report.[2]

# The Planetary Health Diet

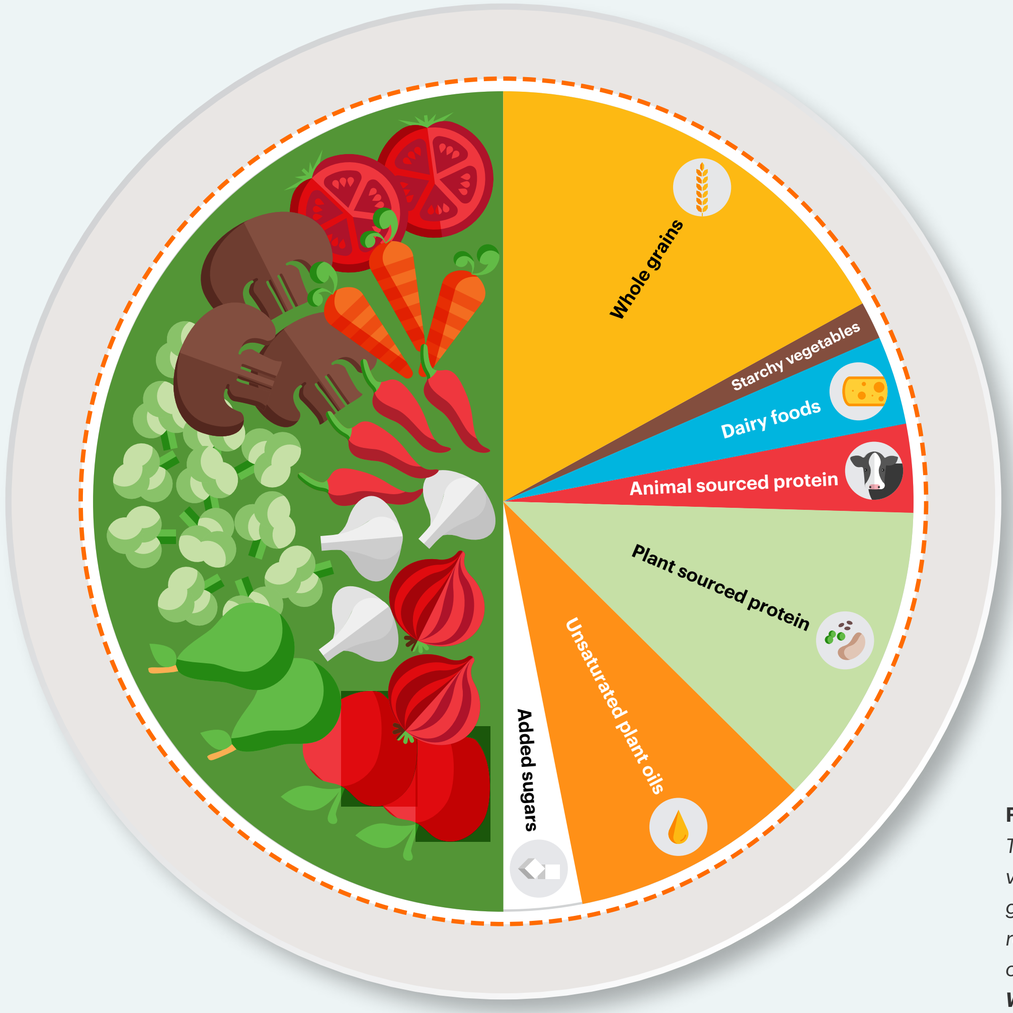



**Figure 7.**
*The Planetary Health Diet by intake values and ranges for major food groups, visually represented by relative proportion of these foods on a plate.* ***Figures adapted from Willett, Rockström, Loken, et al. (2019).***[2] *Click for more information.*

| | | Macronutrient intake grams per day (possible range) | Caloric intake kcal per day | |
|---|---|---|---|---|
| | Whole grains<br>**Rice, wheat, corn and other** | **232** | **811** | Emphasized foods |
| | Protein sources<br>**Legumes**<br>**Fish**<br>**Nuts** | **75** (0–100)<br>**28** (0–100)<br>**50** (0–75) | **284**<br>**40**<br>**291** | |
| | Vegetables<br>**All vegetables** | **300** (200–600) | **78** | |
| | Fruits<br>**All fruits** | **200** (100–300) | **126** | |
| | Added fats<br>**Unsaturated oils** | **40** (20–80) | **354** | |
| | Dairy foods<br>**Whole milk or equivalents** | **250** (0–500) | **153** | Optional foods |
| | Protein sources<br>**Chicken and other poultry**<br>**Eggs** | **29** (0–58)<br>**13** (0–25) | **62**<br>**19** | |
| | Tubers or starchy vegetables<br>**Potatoes and cassava** | **50** (0–100) | **39** | |
| | Protein sources<br>**Beef, lamb and pork** | **14** (0–28) | **30** | Limited foods |
| | Added fats<br>**Saturated oils** | **11.8** (0-11.8) | **96** | |
| | Added sugars<br>**All sugars** | **31** (0–31) | **120** | |

Scientific targets for a planetary health diet, with possible ranges, for an intake of 2500 kcal/day.

# Leading the Way

**The G20 countries** consists of 19 countries plus the European Union (EU28). Collectively, the G20 economies account for around 90% of gross world product, 80% of world trade, "two thirds" of the global population, and approximately half of the global land area.[25] Given their influence, the G20 countries presents a unique “win-win” opportunity for a shift toward healthy flexitarian diets, such as the Planetary Health Diet, to improve the overall health of a majority of the global population while decreasing GHG emissions from food consumption in line with a 1.5°C world. A full analysis of food polices in all G20 countries is beyond the scope of this report and therefore we are using NDGs as an important starting point to determine if current policies are ambitious enough to keep warming to 1.5°C.

## Food consumption patterns in G20 countries

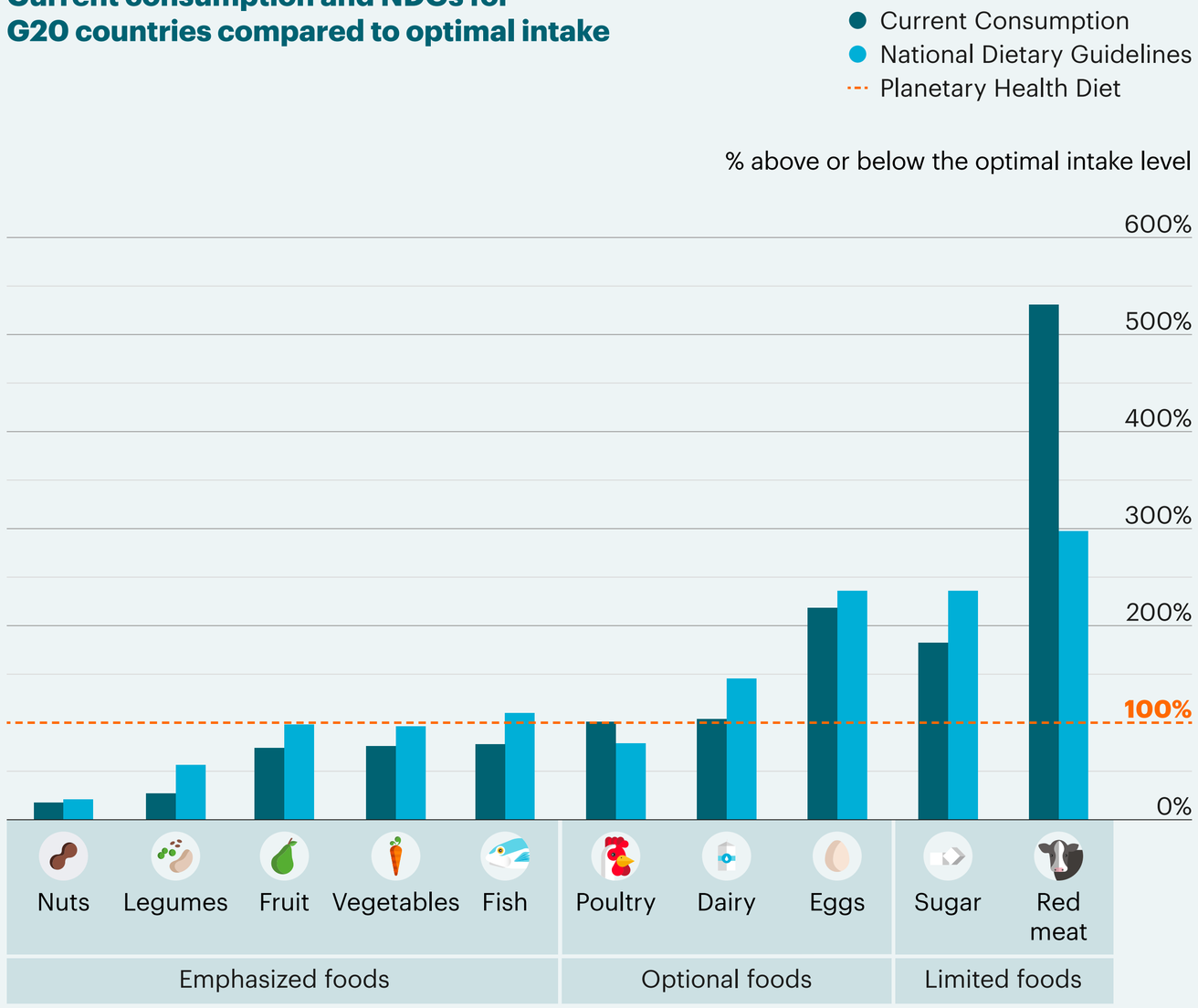
Despite significant variations when it comes to food consumption patterns across the G20 countries, there are some important shared characteristics. With a few exceptions, food consumption patterns across these countries are characterized by an overconsumption of limited and optional foods. Across all countries, there is universal underconsumption of emphasized foods. Furthermore, NDGs for emphasized foods are roughly in line (except for nuts and legumes) with the Planetary Health Diet, whereas most NDGs recommend higher consumption of optional and limited intake foods compared to the Planetary Health Diet (Figure 8).

**Figure 8**

*Total average consumption* patterns and NDG recommendations for the G20 compared to optimal intake levels outlined in the Planetary Health Diet.* ***Data from Springmann et al. (2020).***[24]

**For the analysis in this report, whole grain and starchy vegetable consumption are not shown due to lack of sufficient data across all countries. Data on root vegetables was used to attain calorie balance in the analysis.*

### Current consumption and NDGs for G20 countries compared to optimal intake



# G20 consumption patterns and NDG recommendations by food groups

## Meat

Both current consumption and NDG recommended intake of red meat in most G20 countries are above intake levels to optimize human health (**Figure 9**), and more than half of the countries have current consumption patterns between three to five times the maximum optimal intake value of 28 g/day in the Planetary Health Diet.

## Fruit

Fruit recommendations in most G20 countries are at or above the optimal intake level of 200 g/day in the Planetary Health Diet, but current consumption is below this level in all countries except Brazil, Turkey, Canada, Italy, and France (**Figure 11**). Most countries provide recommendations within the optimal intake range of 100 to 300 g/day.

## Legumes

NDG recommendations for legumes is at or above the Planetary Health Diet optimal intake level of 75 g/day in only five countries, and current consumption is far below this intake level in all G20 countries (**Figure 13**). However, most countries provide recommendations that fall within the optimal intake range of 0 to 100 g/day.

## Dairy

Dairy consumption is slightly more aligned intake levels to optimize human health with half of the countries providing recommendations that fall within the intake range of 0 to 500 g/day. However, only Japan and South Africa have recommendations that are at or below the 250g/day optimal intake level, whereas China and India are just slightly above (**Figure 10**).

## Vegetables

All countries, with the exception of Brazil*, France* and UK*, have recommendations for vegetable consumption that are within optimal intake range of the Planetary Health Diet (200-600 g/day) although consumption levels in all countries are below this optimal intake range except for Turkey, EU28, Italy, USA, South Korea, and China (**Figure 12**).

## Nuts

Nut consumption data shows the greatest deviation from the Planetary Health Diet optimal intake level of 50 g/day, with both NDGs recommendations and consumption well below this intake level (**Figure 14**). However, all countries provide NDG recommendations that fall within the optimal intake range of 0 to 75 g/day.

**Some countries may decide to not offer quantitative targets because these will vary substantially depending on body size and physical activity. For this analysis, however, quantified targets were needed to compare consumption patterns and GHG emissions and every effort was made to translate all targets into comparable quantified targets. When this was not possible (e.g. Canada), then NDG targets were aligned with current consumption levels. This assumption could have an impact in accurately assessing NDG targets in countries that currently do not offer quantified targets.*

## Red meat

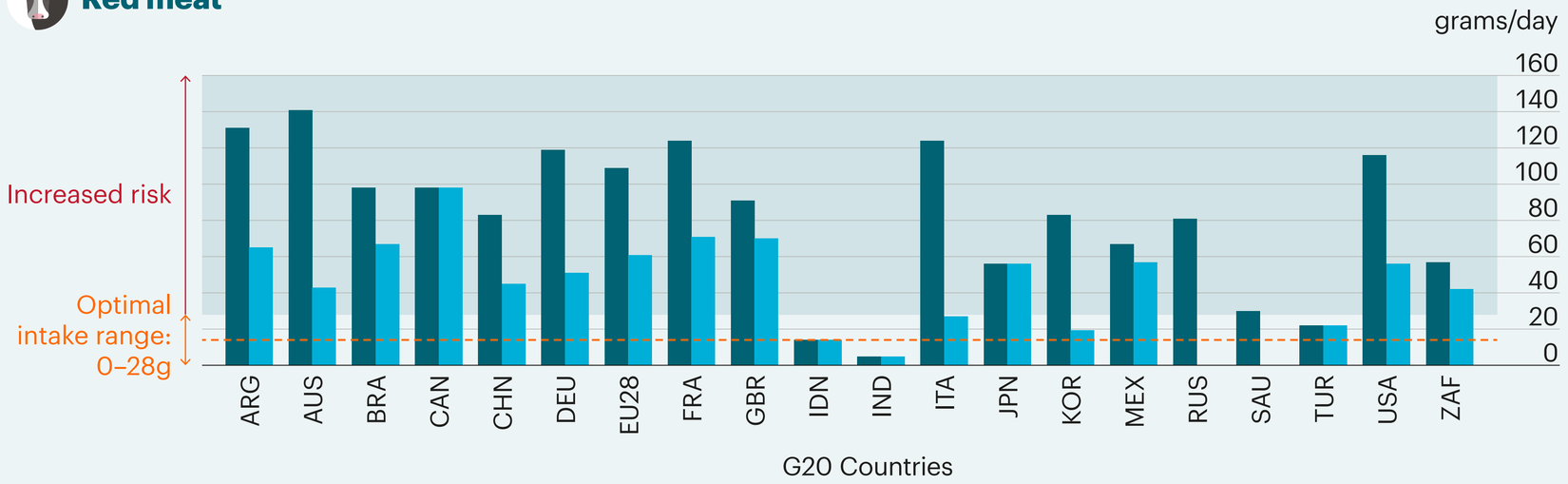



**Figure 9.**
*Current red meat consumption in each G20 country compared to individual country NDGs and the Planetary Health Diet (orange dashed line represents optimal red meat intake level of 14 g/day with optimal intake range of 0 to 28 g/day shown in unshaded area). Outside optimal intake range represents increased risk to human heath and the environment.* ***Data from Springmann et al. (2020).***[24]

## Dairy

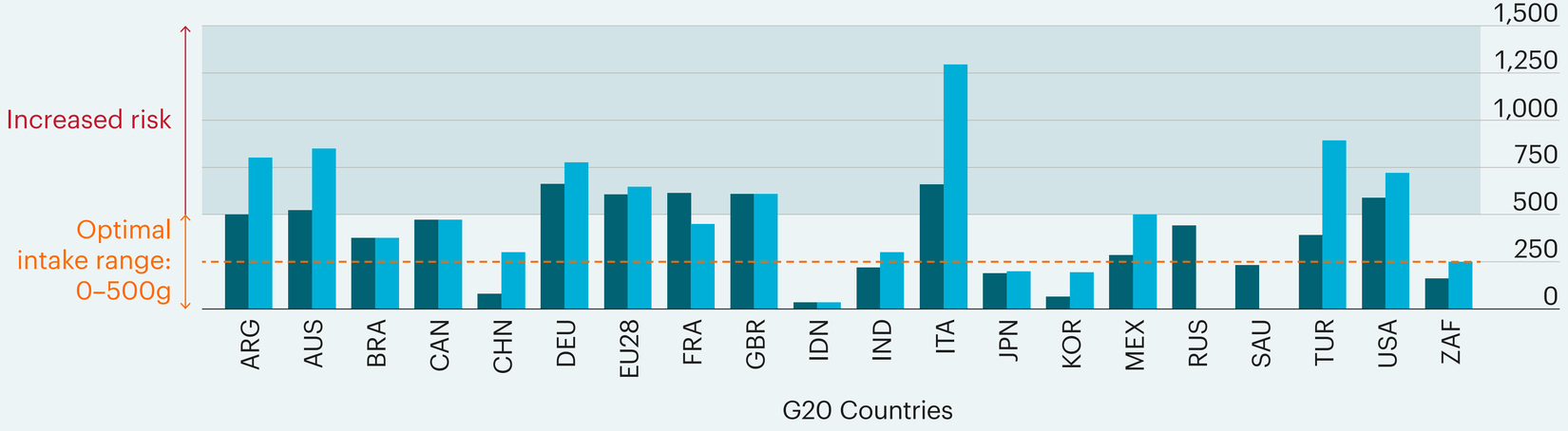



**Figure 10.**
*Current dairy consumption* in each G20 country compared to individual country NDGs and Planetary Health Diet (orange dashed line represents optimal dairy intake level of 250 g/day with optimal intake range of 0 to 500 g/day shown in unshaded area). Outside optimal intake range represents increased risk to human health and the environment.* ***Data from Springmann et al. (2020).***[24]

**Dairy consumption is represented in milk equivalents. Some dairy products, such as cheese, use a large amount of milk to make the product (e.g. 50g cheese = approximately 500g milk) and therefore have a higher emissions footprint.*

## Fruit

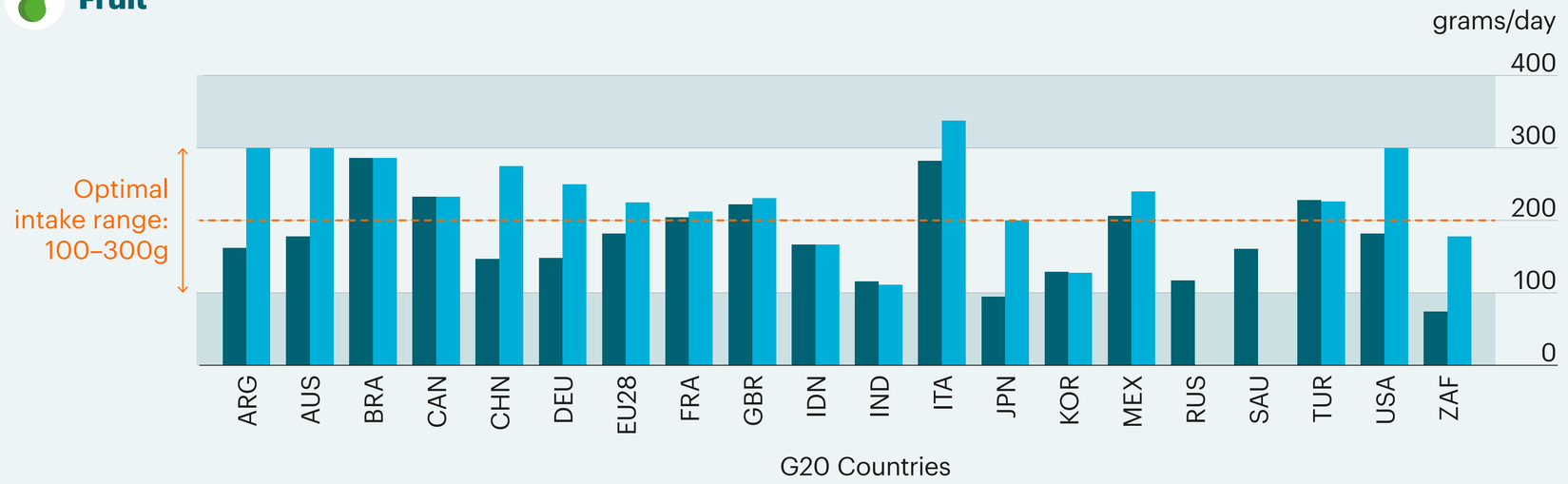



**Figure 11.**
*Current fruit consumption in each G20 country compared to individual country NDGs and Planetary Health Diet (orange dashed line represents optimal fruit intake level of 200 g/day with optimal intake range of 100 to 300 g/day shown in unshaded area).* ***Data from Springmann et al. (2020).***[24]

## Vegetables

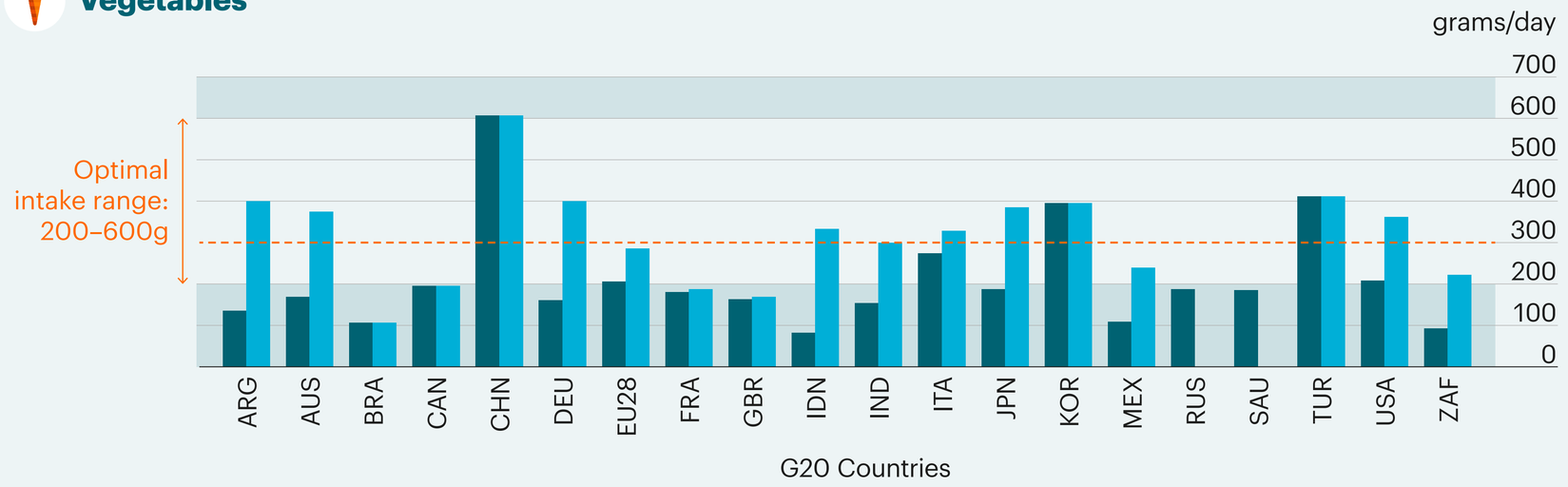



**Figure 12.**
*Current vegetable consumption in each G20 country compared to individual country NDGs and Planetary Health Diet (orange dashed line represents optimal vegetable intake level of 300 g/day with optimal intake range of 200 to 600 g/day shown in unshaded area).* ***Data from Springmann et al. (2020).***[24]

## Legumes

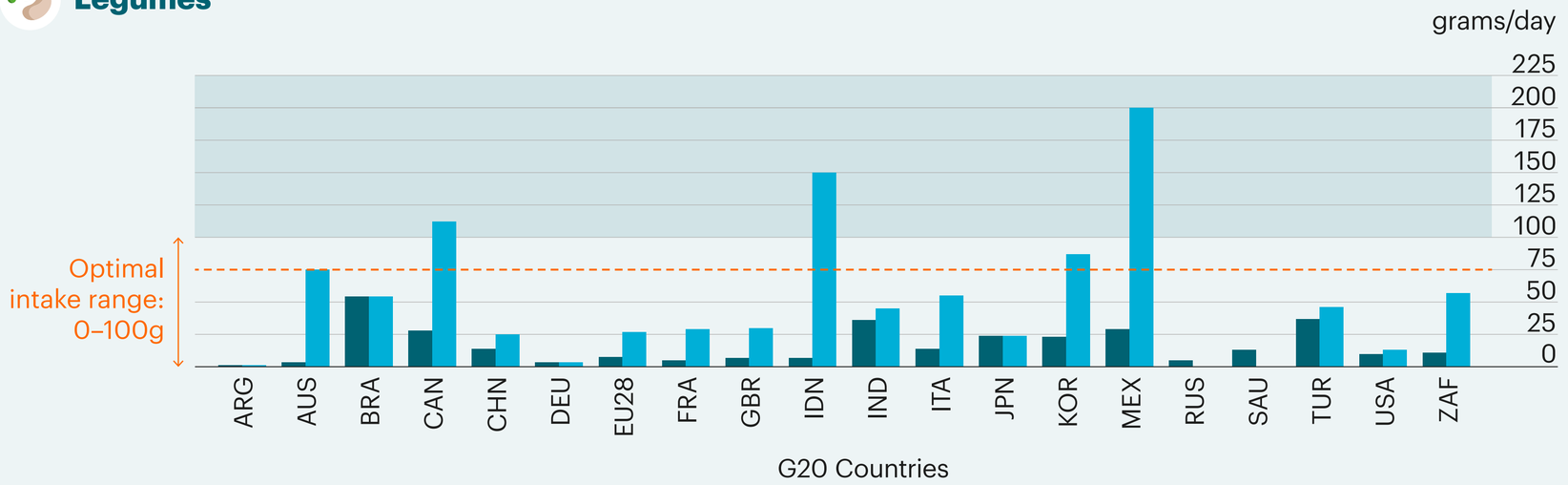



**Figure 13.**
*Current legume consumption in each G20 country compared to individual country NDGs and Planetary Health Diet (orange dashed line represents optimal legume intake level of 75 g/day with optimal intake range of 0 to 100 g/day shown in unshaded area).* ***Data from Springmann et al. (2020).***[24]

## Nuts

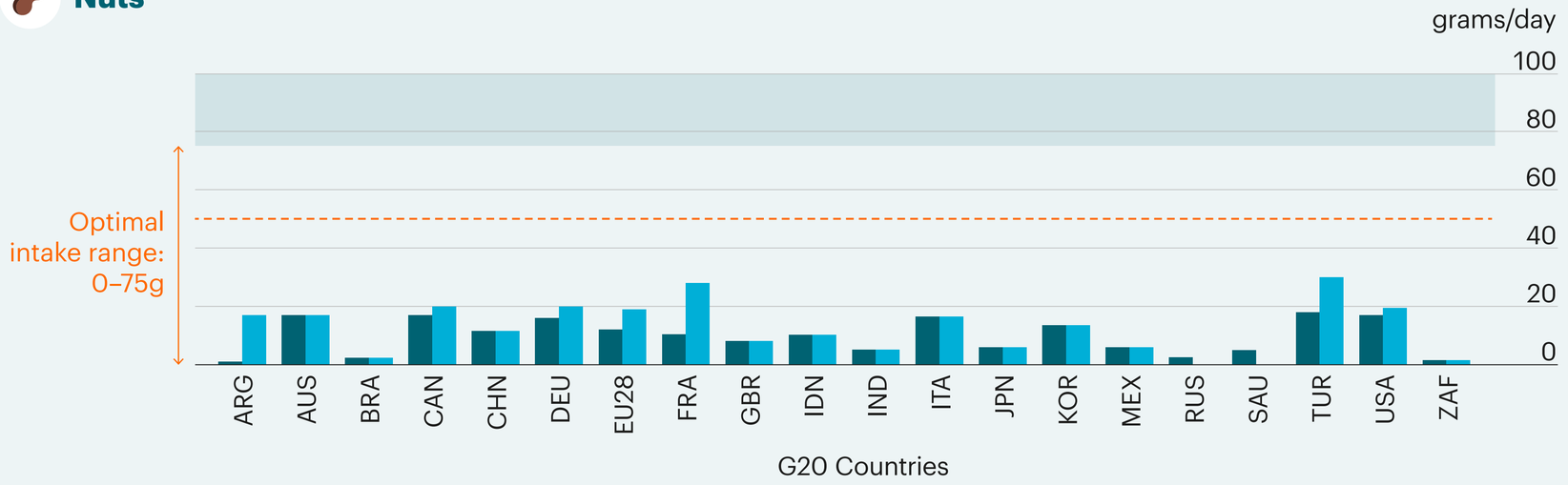



**Figure 14.**
*Current nut consumption in each G20 country compared to individual country NDGs and Planetary Health Diet (orange dashed line represents optimal nut intake level of 50 g/day with optimal intake range of 0 to 75 g/day shown in unshaded area).* ***Data from Springmann et al. (2020).***[24]

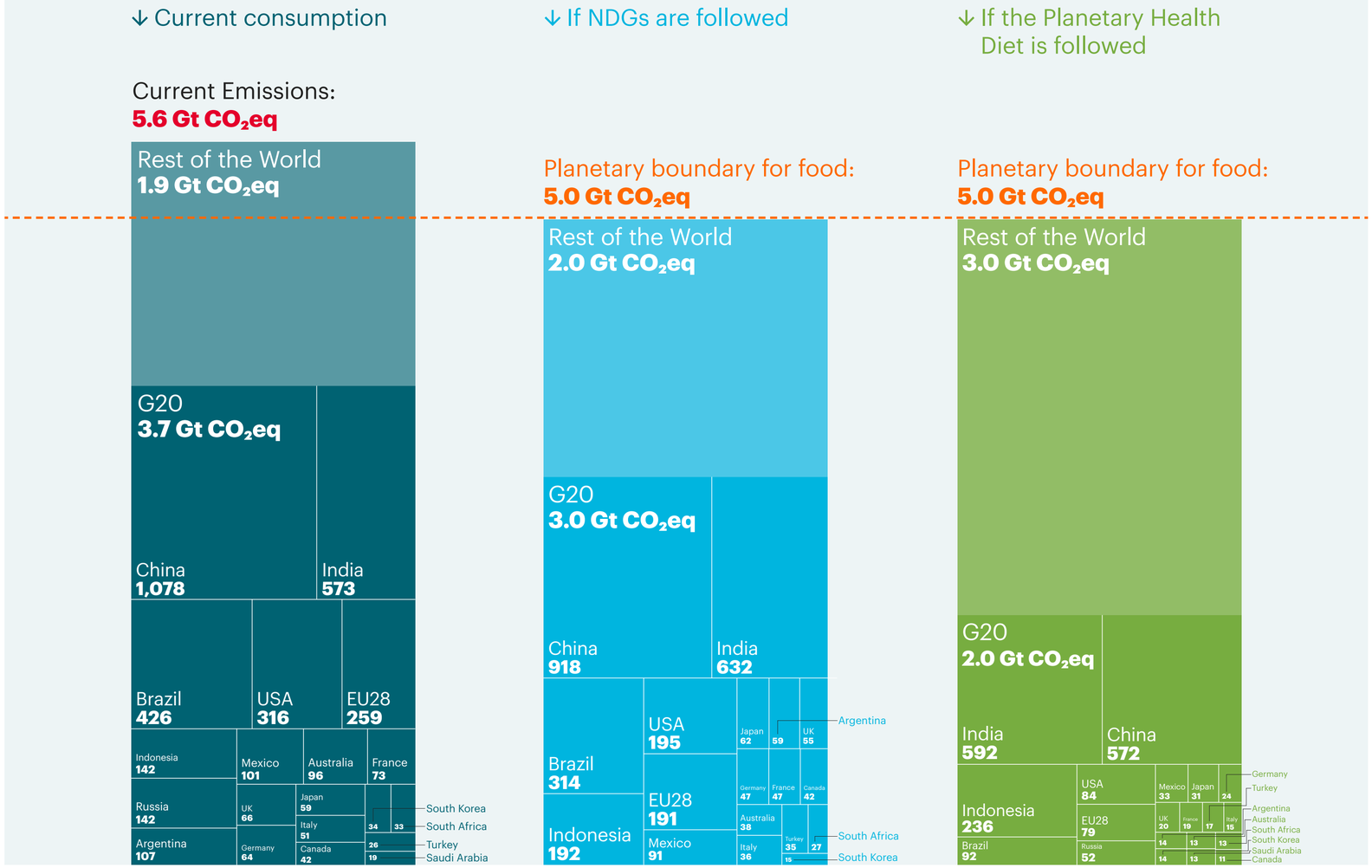

# The Climate Impact – Food Emissions in the G20

**Food-related GHG emissions** in each G20 country can be seen in **Figure 15** below. Total emissions in G20 countries are approximately 3.7 Gt $CO_2$eq of a total 5.6 Gt $CO_2$eq or 66% of current total global food-related GHG emissions. These emissions are driven both by total population in each country and individual food consumption patterns. Currently, the top five most populous countries in the G20 (excluding the EU28) are China, India, United States, Indonesia, and Brazil, which are also the countries with the highest total GHG emissions from food production.[26]

Food consumption patterns that align with current NDGs would reduce total GHG emissions for most G20 countries. If NDGs are universally followed in each country, GHG emissions would be reduced by approximately 19%, while adopting the Planetary Health Diet would reduce food related emissions in G20 countries by nearly 46%. These reductions are mainly achieved through reductions in red meat and dairy consumption. However, adoption of NDGs or the Planetary Health Diet does not reduce GHG emissions in all countries. India and Indonesia would see their total food-related GHG emissions increase slightly if either was adopted in each country. This is most likely because both countries still face burdens of under-nutrition[27, 28] and adoption of either the NDGs or the Planetary Health Diet would result in increased consumption of nearly all food groups including red meat and dairy.

**Figure 15.**
*Total food-related GHG emissions in G20 countries vs the Rest of the World; all figures are Gt $CO_2$eq. Current consumption patterns globally exceed the planetary boundary for food by 0.6 Gt $CO_2$ eq while following either NDGs or the Planetary Health Diet could reduce emissions to within the 5.0 Gt $CO_2$eq boundary, with various GHG distribution scenarios presented.* ***Data from Springmann et al. (2020).***[24]

## Potential of reducing emissions from food consumption patterns in G20 countries

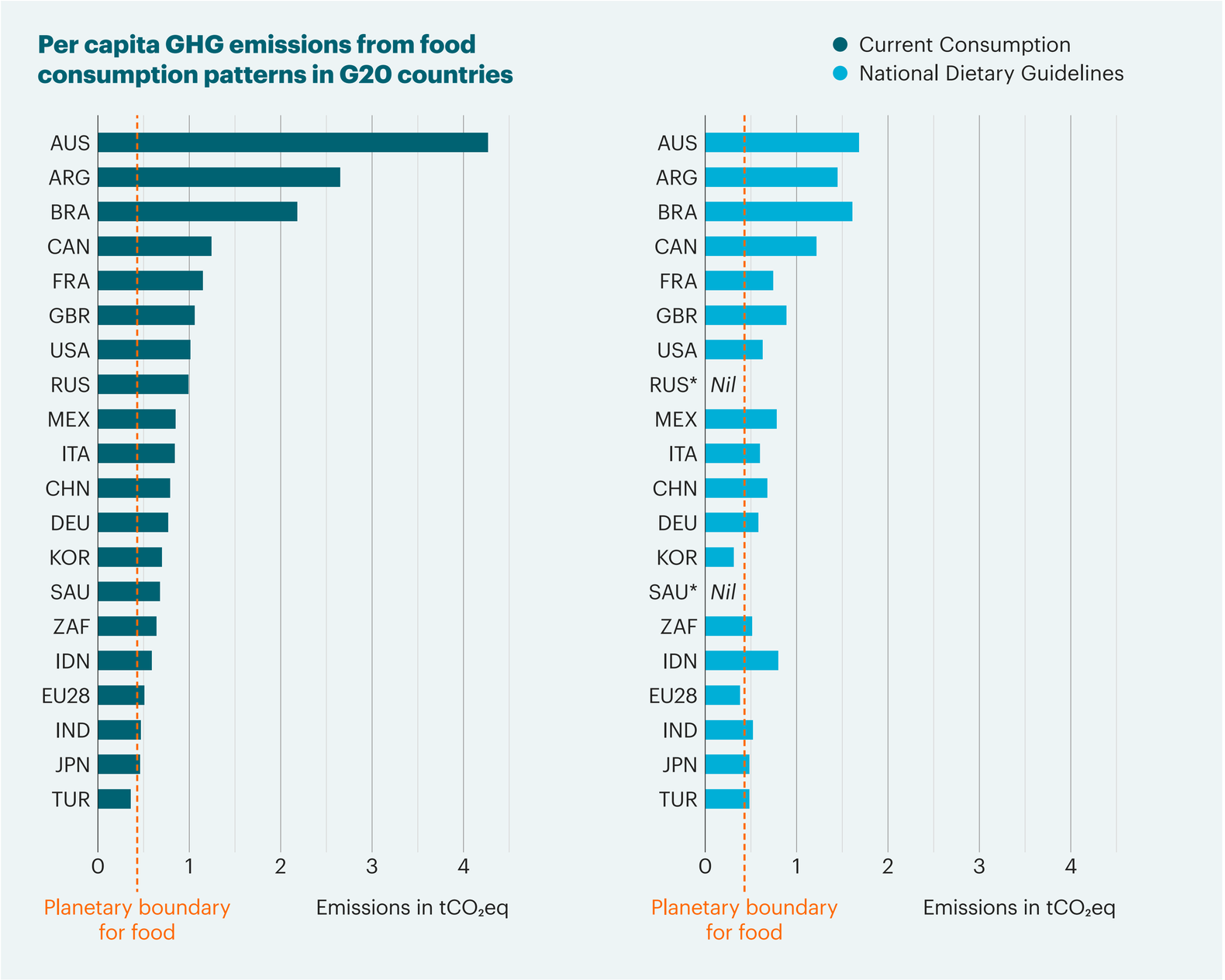


## Per capita GHG emissions

Per capita emissions tell a different story, with Australia, Argentina, Canada, and France having the highest per capita food-related GHG emissions of G20 countries, while China and India some of the lowest. Again, NDGs and the Planetary Health Diet decrease per capita emissions in all countries with the exceptions of both India and Indonesia, where per capita emissions rise slightly when compared with baseline emission levels (Figure 16).

**Figure 16.**
*Per capita emissions in each G20 country for current consumption patterns and if national dietary guidelines (NDGs) are followed. The orange dashed line represents the 5.0 Gt global planetary boundary for food consumption translated into a per capita planetary boundary for food consumption. It is difficult to propose a single per capita boundary for food consumption because the actual per capita boundary would vary depending on local conditions. However, this exercise allows us to see roughly the level of ambition needed in each country to ensure food-related emissions are compatible with a 1.5ºC world.* **Data from Springmann et al. (2020).[24]**

**NDGs are not available in these countries.*



# Achieving Healthy Diets for All Within Planetary Boundaries

**In addition to setting scientific targets** for healthy diets and sustainable food production, the EAT-*Lancet* Commission sought to determine if it was possible to achieve these targets while feeding 10 billion people. In short, the answer is yes, but just barely. Feeding 10 billion people a healthy flexitarian diet (e.g. Planetary Health Diet) within the 5 Gt $CO_2$eq GHG planetary boundary for food production requires a theoretically near universal adoption of healthy diets across the globe by 2050, improvements in technology and management at the farm level and halving food loss and waste.

In the previous section we assessed food consumption in G20 countries. In this section we use these results to draw insights on the global implications of current food consumption patterns in G20 countries and how the 5 Gt $CO_2$eq food budget may need to be more equitably distributed to achieve healthy diets for all.

Numerous studies in recent months have demonstrated that a shift toward healthy diets, such as the Planetary Health Diet, is the single greatest lever for reducing food related GHG emissions.[1,2,4,17] The Exponential Roadmap[4] report built upon this growing body of scientific evidence and outlined specific solutions to halve current levels of global GHG emissions by 2030. For food consumption, achieving this required different approaches for G20 countries than for the rest of the world. First, a rapid rise in food-related emissions (from 5.6 to 6.8 Gt by 2030) must be prevented by reversing shifts in many developing countries towards unhealthy "Western" diets. Second, countries with high food-related emissions (i.e. many of the G20 countries) must rapidly adopt healthy flexitarian diets, such as the Planetary Health Diet. When these approaches are coupled with a 50% reduction in food loss and waste, global food-related emissions can be brought within the planetary climate boundary for food by 2050 (see Figure 3).

**Reducing emissions to within the planetary climate boundary for food can be accomplished by preventing an unhealthy dietary transition in many parts of world and implementing ambitious dietary shifts in G20 countries with at least 40% of the global population adopting healthy diets by 2030 and 75% by 2050. This dietary shift must also be coupled with efforts to reduce food loss and waste by 50%.**

## Projected food-related GHG emissions if G20 consumption patterns are adopted globally

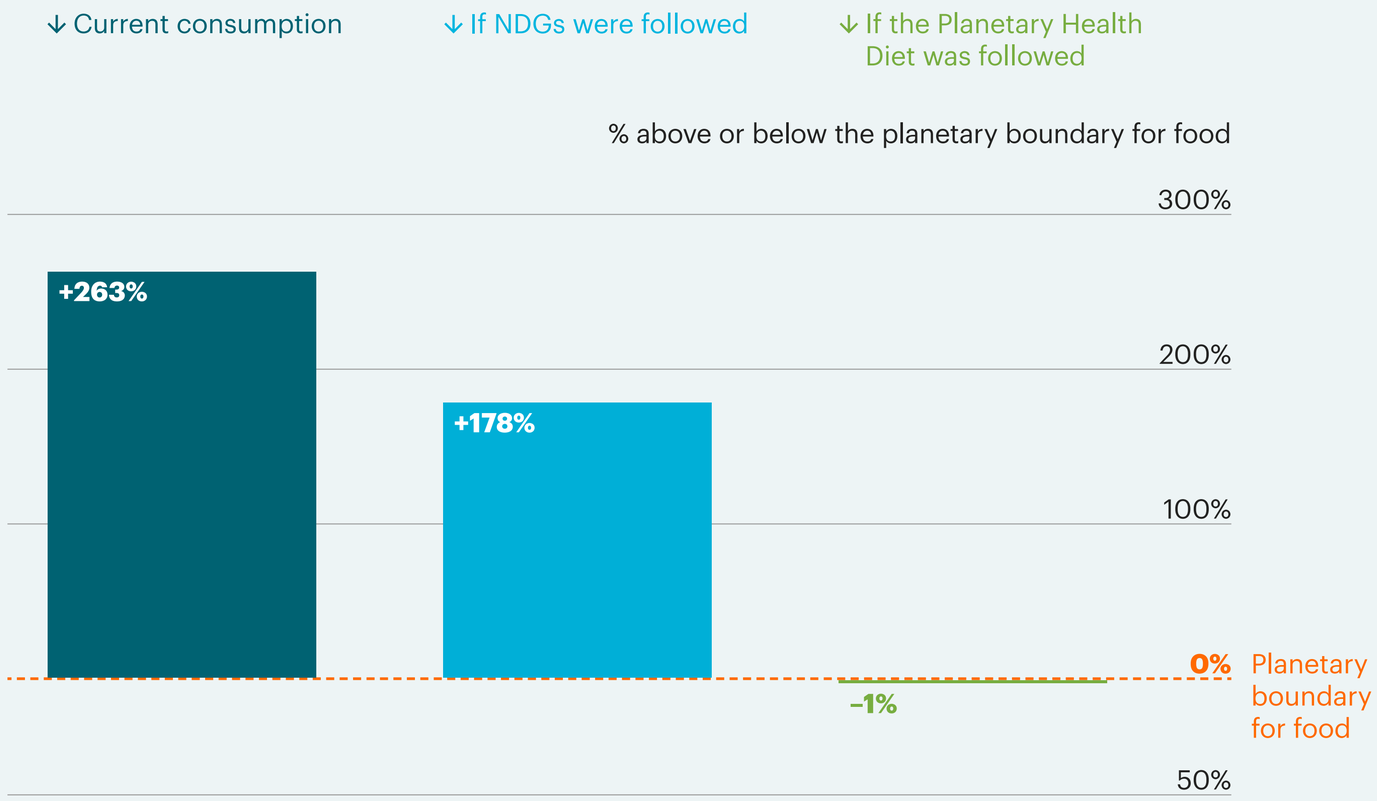



**Figure 17.**
*The projected impact on food-related GHG emissions by 2050 if either current consumption patterns or NDGs of G20 countries are adopted globally and if a local adaptation of the Planetary Health Diet is adopted in all countries. Each case assumes improvements in technology and management at the farm level, as well as reductions in food loss and waste* ***see Springmann et al. (2018).***[29] *The orange dashed line represents the planetary climate boundary for food.* ***Data from Springmann et al. (2020).***[24]

### An unsustainable path

The previous section highlighted that current food consumption patterns in G20 countries could be more healthy and sustainanble, and largely trending in the wrong direction. If these trends continue within and beyond the G20 countries, food-related GHG emissions will exceed the 5 Gt $CO_2$eq climate boundary for food by approximately 263% by 2050 (Figure 17). The majority of these emissions in G20 countries arises from an overconsumption of limited intake and optional foods in nearly every country, trends that are also on the rise elsewhere. However, even if the NDGs of G20 countries are adopted globally, the planetary climate boundary for food would still be exceeded by approximately 178%. This highlights that current NDGs are not ambitious enough to keep total global warming to 1.5ºC.

**Global adoption of the Planetary Health Diet would decrease emissions to within the planetary GHG boundary for food but requires near universal adoption (Figure 17).**

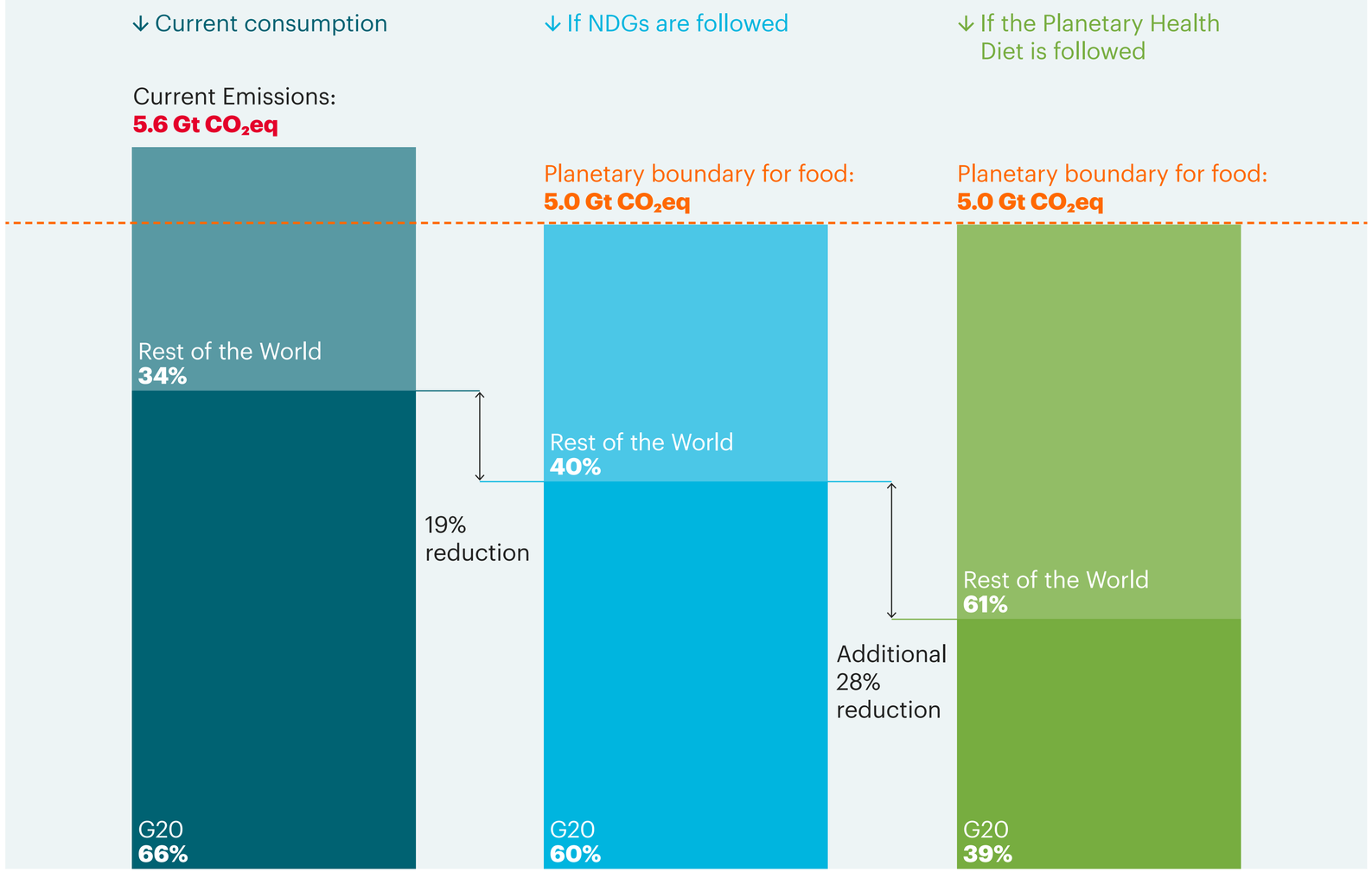
When coupled with a 50% reduction in food loss and waste, a 75% global adoption of the Planetary Health Diet would reduce emissions within the global boundary for food (Figure 17). However, when significant changes in food production are combined with a dietary shift and halving of food loss and waste, there is evidence that we can produce food for 10 billion people within all planetary boundaries (i.e. climate, land-use, water, nitrogen, phosphorus, and biodiversity loss) for food.[2]

## Unbalanced global consumption of food

Currently the food systems in G20 countries are emitting approximately 3.7 Gt $CO_2$eq, nearly 75% of the total global carbon budget for food. The grand challenge facing humanity is how we will sustainably feed healthy diets to nearly 10 billion people by 2050 and do this within the planetary boundary for food-related GHG emissions, a boundary we are already exceeding by 12% (see Figure 18). The majority of the projected population increase will take place in developing countries,[30] many of which are facing high rates of malnutrition with nearly 820 million people currently suffering from hunger and hundreds of millions from stunting and wasting.[2]

**Figure 18.**
*Scenarios of current and future distributions of total global food-related emissions. Currently, G20 countries are consuming the majority of the total global carbon budget for food. However, adoption of the Planetary Health Diet in G20 countries will help to more equitably balance the total global carbon budget for food especially as population grows in non G20 countries. The orange dashed line represents the 5 Gt $CO_2$eq planetary climate boundary for food production, which is currently exceeded by approximately 12%.* ***Data from Springmann et al. (2020).***[24]

## Scenarios of a more equitable distribution of the global carbon budget for food



Central to solving this dilemma is a more equitable distribution of the global carbon budget for food to enable all countries to alleviate all forms of malnutrition, while keeping total food-related GHG emissions within the planetary climate boundary for food (**Figure 18**). To do this we need to lower total global food related emissions from 5.6 Gt $CO_2$eq to at least 5.0 $CO_2$eq by rapidly shifting diets in G20 countries to healthy and sustainable diets that are more ambitious than those currently proposed by NDGs. This would require an on average approximate halving of current per capita GHG emissions in G20 countries. In addition, we need to work to ensure that unhealthy diets are not adopted in parts of the world where current consumption aligns more closely with healthy flexitarian diets. Overconsumption of red meat, highly processed foods, and sugar in these countries will not only result in higher incident of poor health, but also in a nearly doubling of current food-related GHG emissions.

Although we use 2050 as a cutoff in the analysis done for this report, the issues discussed extend well beyond 2050. Global population is expected to exceed 11 billion people by 2100 unless actions are taken to stabilize population growth.[31] A recent analysis by Gerten (et al. 2020) showed that it is possible to feed 10 billion people within planetary boundaries but only with a transformation toward more sustainable production and consumption patterns. However, ensuring healthy and sustainable diets to everyone on the planet becomes increasingly unlikely past this population threshold.[32]

### A "win-win" solution for people and planet

Rebalancing the global distribution of food emissions as outlined in **Figure 18** would not only keep total global food related emissions within the planetary climate boundary for food but would also have the co-benefit of improving and saving lives. The EAT-*Lancet* Commission showed that adopting the Planetary Health Diet would save approximately 11 million lives per year.[2] Current NDGs in G20 countries are not ambitious enough to meet climate goals but they will help countries make progress toward achieving the SDG Goal 3 Target 3.4 of reducing premature mortality by 2030.[33] However, adopting more ambitious dietary patterns, such as the Planetary Health Diet, would enable these countries to achieve additional SDGs.

# A Roadmap for Change

**The IPCC 1.5 Special Report** and other recent research firmly conclude that stabilizing temperature at 1.5°C above pre-industrial levels is essential and will require an extraordinary transformation of lifestyles, behaviors, norms and values in our society.[1, 4, 11, 12] Not doing so risks the potential of crossing irreversible climate tipping points which may result in a cascade of unstoppable or runaway events such as the irreversible loss of ice sheets or forests.[34] These tipping points could be exceeded even between 1°C and 2°C of warming, which makes the 1.5°C target even more critical.[12] Despite this existential threat to humanity, current country level commitments (i.e. Nationally Determined Contributions or NDCs) puts the world on a path of at least 3.0°C warming. To make matters worse, emissions are currently rising at a rate of 1.5% per year with G20 countries being responsible for approximately 78% of global emissions.[35]

The Carbon Law outlines the pace of change required to limit global warming to 1.5°C by 2100 for all sectors (**see Figure 2**). However, as pointed out in this report, food-related emissions are slightly different. The global objective with the food sector should be to prevent current food related emissions from rising further and reduce current total food-related emissions roughly 12%, from 5.6 Gt $CO_2$eq to 5.0 Gt $CO_2$eq. When coupled with reductions in food loss and waste, this can be achieved by a 40% global shift to healthy and sustainable diets by 2030 and 75% by 2050.[4] The majority of this 40% shift by 2030 toward healthy flexitarian diets needs to happen in the G20 countries as these are the countries that currently have the largest food-related GHG emissions.



**Figures 19 and 20.**
*By 2050, the number of Earths that would be needed (ecological footprint) to support food production within the planetary climate boundary if all countries globally adopted either current consumptions patterns or the NDGs of individual G20 countries.* ***Data from Springmann et al. (2020).*** [24]

**Current consumption estimates were used since NDGs do not exist.*

However, consumption patterns in G20 countries vary considerably and some countries will require deeper transformations than others and adoption of more ambitious NDGs.

**If the global population followed current consumption patterns in individual G20 countries or adopted their NDGs only India and Indonesia would have food consumption patterns that are within the planetary climate boundary for food (Figures 19 and 20).**

Global adoption of current food consumption patterns in G20 countries would require between one to nearly 7.4 Earths (Figure 19). NDGs perform slightly better but are still not ambitious enough to stay within the planetary boundary for food-related GHG emissions for most countries. Global adoption of the NDGs of G20 countries would require between one to nearly 4.7 Earths (Figure 20). Only global adoption of the NDGs of Indonesia and India would keep total global emissions within the boundary.

# Critical Conclusions

## 1

**The power is on our plates.** Choosing healthy and sustainable food is one of the single most powerful actions that an individual can take to combat climate change. G20 countries can use ambitious NDGs to influence these choices.

## 2

**Many G20 countries have taken significant steps to promote more plant-based diets, but it's time to raise ambition from incremental to exponential action.** We need global cooperation to ensure that all NDGs are aligned with achieving the SDGs and Paris Agreement.

## 3

**Raising the ambition of NDGs is a "win-win" solution for people and planet.** This would enable all countries to alleviate all forms of malnutrition while keeping total food-related GHG emissions within the planetary climate boundary for food.

## 4

**The magnitude of the shift toward healthy flexitarian diets will not be the same in all countries.** Some G20 countries will require more ambitious reductions of per capita emissions while others will require less.

## 5

**A food system transformation will look differently in each G20 country.** There is no single policy that can account for the socio-economic and environmental diversity found each G20 country and although a global issue, solutions to transform the food system must be nation specific.

## 6

**Adopting a healthy flexitarian diet can restore the planet.** Doing so would reduce food-related GHG emissions globally below the planetary climate boundary for food while at the same time saving millions of lives.

## 7

**Raising the ambition of NDGs can help create coherent public health, agricultural, and food policies.** This is an opportunity to ensure policy measures and individual food consumption choices, alike, are driving in the same direction to enable optimization of behavior changes from top-down and bottom-up approaches.

# Methodology Used in this Report

Given that many NDGs do not provide quantitative recommendations, a graded coding method was developed in the analysis[24] to extract quantitative values from each guideline. To do this, the NDGs were reviewed with respect to recommendations on a set of specific food groups of interest (**Figure 7**). Then, the mix of quantitative and qualitative recommendations found in those guidelines was translated into quantitative representations of consumption choices for each food group. Last, the representations were applied to estimates of current intake per food group and country. For analyzing the health and climate implications of NDGs, a comparative risk assessment of diet-related disease mortality, and food and country-specific emissions footprints were used to assess chronic-disease mortality and total GHG emissions for current consumption patterns in each country and if the NDGs and the Planetary Health Diet were adopted both nationally and at a global level. More details on the methodology can be found in Springmann et al. (2020).

# Scope and Limitations

Central to any assessment of diets needs to be an understanding that diets provide an inextricable link between human health and environmental sustainability. The EAT-*Lancet* report found that a shift toward the Planetary Health Diet would save nearly 11 million lives while reducing environmental impacts. In this report we acknowledge this important link between human health and environmental sustainability but focus the main assessment on climate impacts. A more detailed assessment of the health impacts of dietary guidelines can be found in Springmann et al. (2020).

The EAT-*Lancet* Commission on healthy diets from sustainable food systems developed quantitative global scientific targets for healthy diets and sustainable food systems, and assessed whether it was possible to achieve healthy diets for 10 billion people within planetary boundaries. The Commission found that this goal can be achieved but requires a combination of substantial shifts toward mostly plant-based and flexitarian dietary patterns, dramatic reductions in food loss and waste, and major improvements in food production practices. In this report, we use the scientific targets for healthy diets and sustainable food production to assess national dietary guidelines (NDGs) within G20 countries.

The world is made up of a variety of rich and vibrant diets and culinary traditions including in G20 countries. We have chosen to focus on the G20 in this assessment given their geopolitical importance, the majority of the global population resides in these countries, they produce a large share of the world's food supply and a majority of unsustainable and unhealthy food consumption takes place within their borders (yet under-nutrition still persists!). In addition, the annual gatherings of G20 leaders have evolved into a major forum for shaping the global economic policy agenda and discussing pressing global challenges. Transforming the global food system is one of the most pressing issues of our time and it is high time that the G20 summits and other gatherings focus on this critical policy agenda.

A stable Earth system depends upon the continued functioning of multiple biophysical systems, including climate change, nitrogen and phosphorus cycling, freshwater use, land-system change and biodiversity loss. There is also strong scientific evidence that food production is among the largest drivers of global environmental change due to its impact on most biophysical systems. In this report, however, we focus solely on greenhouse gas (GHG) emissions given the particular importance of this system in regulating and maintaining a stable Earth system.

# Glossary And Country Abbreviations

| | | | |
|---|---|---|---|
| **ARG** Argentina | **FRA** France | **JPN** Japan | **KOR** Korea |
| **AUS** Australia | **DEU** Germany | **MEX** Mexico | **TUR** Turkey |
| **BRA** Brazil | **IND** India | **RUS** Russia | **GBR** United Kingdom |
| **CAN** Canada | **IDN** Indonesia | **ZAF** South Africa | **USA** United States |
| **CHN** China | **ITA** Italy | **SAU** Saudi Arabia | **EU28** European Union |

**$CO_2eq$**
Carbon dioxide equivalent - measure used to compare the emissions from various greenhouse gases based on their global warming potential

**GHG**
Greenhouse gas

**G20**
An international forum for the governments and central bank governors from 19 countries and the European Union (EU)

**NCD**
Non-communicable disease

**NDG**
National Dietary Guideline

**SDGs**
Sustainable Development Goals

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# About EAT

EAT is an Oslo based non-profit with a global mission to transform our global food system through sound science, impatient disruption and novel partnerships. EAT is focused on shifting the global food system toward a fair and sustainable model that promotes health for both people and planet. Cutting across sectors and disciplines, EAT brings together policy makers, industry leaders, researchers and civil society from around the world to develop realistic, practical solutions that yield big impact and fast. Learn more at **www.eatforum.org**. The EAT-*Lancet* report is available to download **https://www.thelancet.com/commissions/EAT**