Can your actions really save the planet? 'Planetary accounting' has the answer

October 25 2018, by Peter Newman And Kate Meyer

Credit: AI-generated image (disclaimer)

The climate is changing before our eyes. News articles about imminent species extinctions have become the norm. Images of oceans full of plastic are littering social media. These issues are made even more daunting by the fact that they are literally global in scale.

In the face of these global environmental crises it can be hard to know where to start to help change the state of our planet. But in a paper published in the journal Sustainable Earth, we set out how to translate many of our global environmental issues into action at a more manageable level.

Our approach aims to chop global problems into digestible chunks that you – as an individual, a chief executive, a city councillor, or a national committee member – can tackle.

We call it "planetary accounting," because it is about creating a series of environmental "budgets" that will stop us overshooting the planet's natural boundaries. From that, we can then calculate everyone's fair share, and hopefully in the process make it easier to visualise which individual, corporate or community actions will have a real environmental impact.

The planetary boundaries, developed in 2009, are a set of non-negotiable global limits for factors such as temperature, water use, species extinctions and other environmental variables. These aim to quantify how far we can push the planet before threatening our very survival.

Earth system process	Control variable	Planetary Boundary
Climate change	Atmospheric concentration of carbon dioxide Change in radiative forcing	≤ 350ppm ≤ 1W/m^2
Biodiversity loss	Global extinction rate	≤ 10E/MSY
Nitrogen and phosphorus cycles	Reactive nitrogen removed from the atmosphere Phosphorous flowing into oceans	≤ 62Tg ≤ 11Tg
Stratospheric ozone depletion	Stratospheric concentration of ozone measured in Dobson Units (DU)	≤ 5% below pre-industrial levels (290 DU)
Ocean acidification	Mean saturation state with respect to aragonite in the oceans	≥80% of the pre-industrial level
Fresh water use	Freshwater consumption	≤4000 km^3/yr
Change in land-use	Area of forested land as a percentage of original forest cover	≥ 75%
Novel entities	NA	NA
Atmospheric aerosol loading	Aerosol optical depth	NA Regional limit of ≤ 0.25

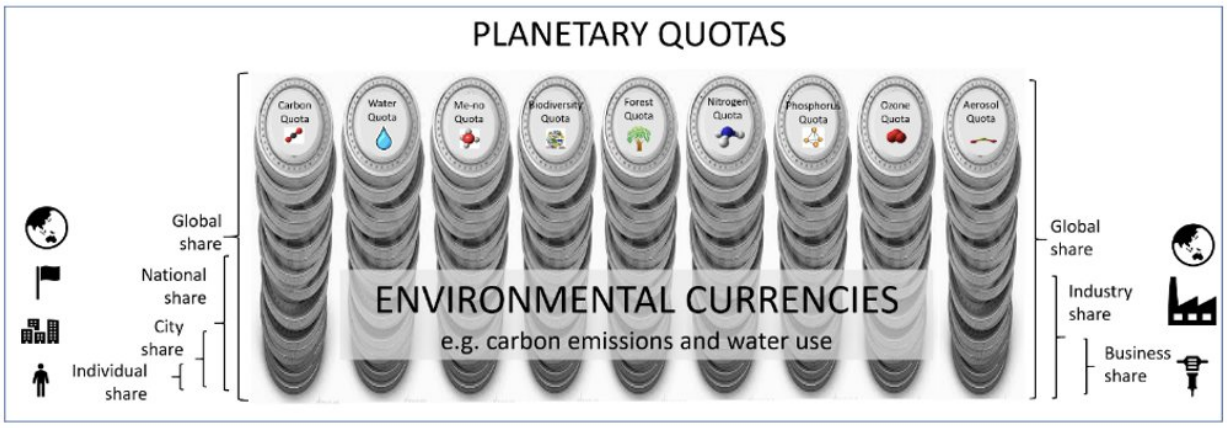
Summary of the planetary boundaries. Credit: Adapted from Steffen et al. 2015, Author provided

The nine planetary boundaries are listed below; exceeding any of these limits puts us at risk of irreversible global damage. We are currently exceeding four, so it's fair to say the situation is urgent.

Despite providing important information about the health of our planet, the planetary boundaries fail to answer one very important question: what can we do about it?

The problem with the planetary boundaries is that they are limits for the environment, not for people. They cannot be easily related to human activities, nor do they make sense at smaller scales.

A national government would be hard-pressed to determine what a fair share of the world's species extinctions might be. A commuter deciding whether to take the bus or drive to work doesn't really know how her decision will affect the amount of carbon dioxide in the atmosphere. The planetary boundaries measure outcomes; they do not prescribe actions.



The Planetary Quotas are global budgets for environmental pressures that can be divided and managed at different levels and areas of society. Credit: Peter Newman/Kate Meyer, Author provided

The ecological footprint – which estimates how many Earths would be required for a given level of human activity – has long been used as a tool for environmental policy and action. But many experts think this measure is too simplistic. How can a single statistic possibly capture the range and complexity of human impacts on our planet?

Planetary accounting

This is where planetary accounting comes in. It offers a new approach to understanding the global impacts of any scale of human activity. It takes

the "safe operating space" defined by the planetary boundaries, and then uses these limits to derive a set of quotas that we can act on.

Using this approach, we have drawn up a set of ten global budgets for environmental factors, including carbon dioxide emissions, release of nitrogen to the environment, water consumption, reforestation, and so on.

Planetary Quota	Control Variable and Global Limit	Description of Control Variable
Carbon dioxide	Net CO_2 emissions ≤ -7.3 $GtCO_2$/yr	Net CO_2 emissions including land use and land-use change emissions.
Me-NO	Me-NO emissions ≤5.4$GtCO_2e$/yr	Total warming potential of methane and nitrous oxide emissions expressed in terms of equivalent CO_2 emissions (CO_2e).
Forestland	Reforestation ≥11Mha/yr	Net reforested land area.
Aerosols	0.04 ≤ AODe ≤ 0.1	Emissions of aerosols and precursor gases expressed in terms of equivalent aerosol optical depth (AODe)
Ozone	Montreal gas emissions ≈≤0 ODPkgs/yr	Emission of gases controlled or due to be controlled under the Montreal Protocol in terms of ozone depleting potential weighted kilograms (ODPkg)
Nitrogen	Net nitrogen released to the environment ≤62Tg/yr	Net reactive nitrogen released to the environment.
Phosphorous	Net phosphorus released to the environment ≤11Tg/yr	Net phosphorus released to the environment.
Water	Net water consumption ≤8500km^3/yr	Net green, blue and grey water consumption
Biodiversity	Percentage disappearing fraction of species ≤ 1E-4/yr	Net percentage disappearing fraction of species due to land occupation and transformation
Novel entities	Net imperishable waste ≤ 0kg	Imperishable waste released to the environment less imperishable waste removed from the environment.

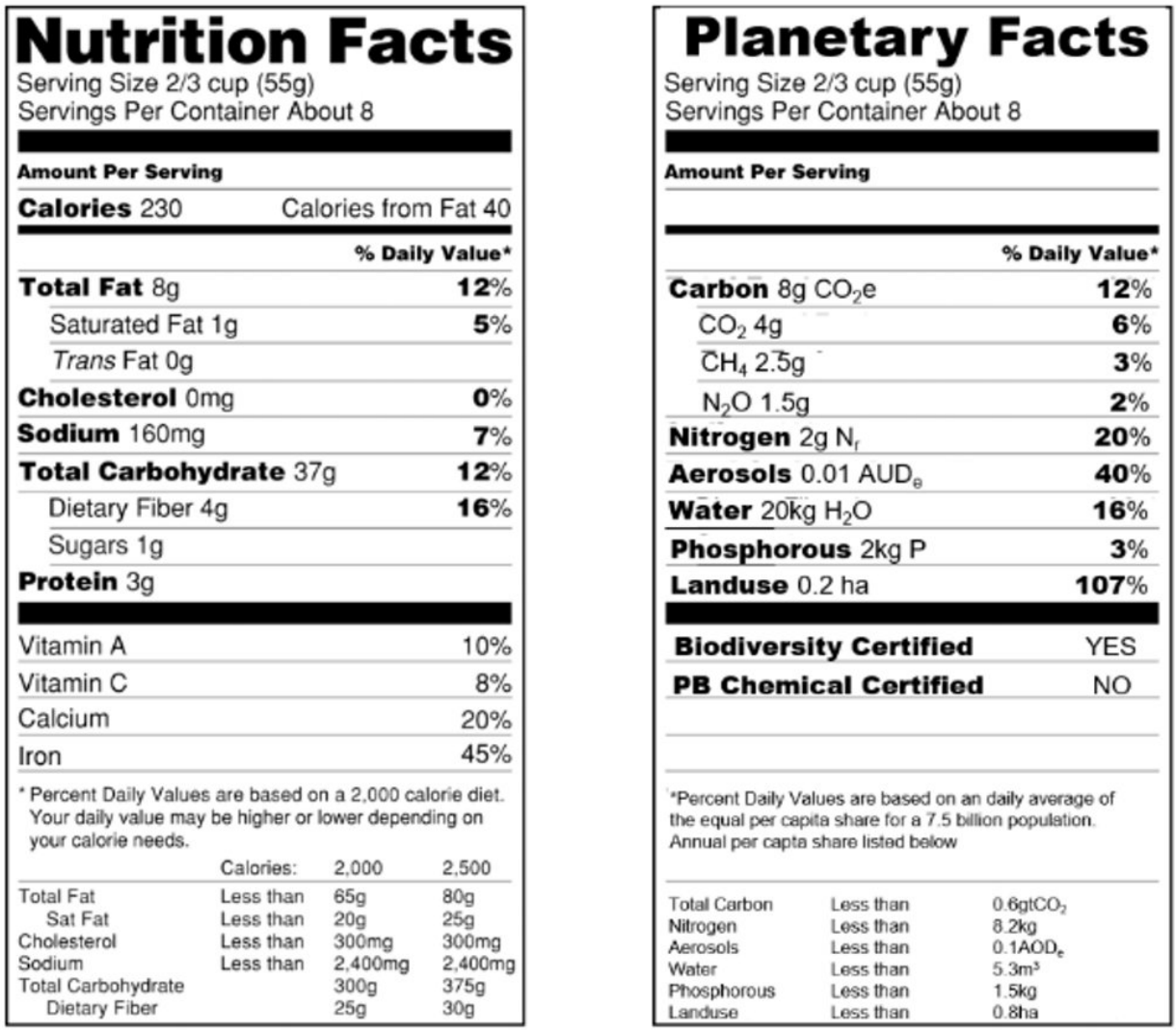
The planetary quotas. Credit: Peter Newman/Kate Meyer, Author provided

These budgets can then be divided among the world's population in easily quantifiable units. That way, nations, cities, businesses and even individuals can begin to understand what their fair share actually looks like.

If the planetary boundaries are a health check for planet Earth, then you can think of these quotas as the prescription for a healthy global environment.

To extend the health analogy, it's rather like having a general checkup with a doctor, who might measure a range of variables such as your blood pressure, heart rate, weight and liver function. If any of these are outside the healthy range, the doctor might recommend a healthier diet, more exercise, or avoiding smoking or drinking too much.

Similarly, if we find we are exceeding our environmental fair share – say, by taking too much carbon-intensive transport, or eating too much nitrogen-intensive food – then we can begin to take action.



Nutrition Facts

Serving Size 2/3 cup (55g)
Servings Per Container About 8

Amount Per Serving

Calories 230	Calories from Fat 40
	% Daily Value*
Total Fat 8g	**12%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**12%**
Dietary Fiber 4g	**16%**
Sugars 1g	
Protein 3g	
Vitamin A	10%
Vitamin C	8%
Calcium	20%
Iron	45%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Planetary Facts

Serving Size 2/3 cup (55g)
Servings Per Container About 8

Amount Per Serving

	% Daily Value*
Carbon 8g CO_2e	**12%**
CO_2 4g	**6%**
CH_4 2.5g	**3%**
N_2O 1.5g	**2%**
Nitrogen 2g N_r	**20%**
Aerosols 0.01 AUD_e	**40%**
Water 20kg H_2O	**16%**
Phosphorous 2kg P	**3%**
Landuse 0.2 ha	**107%**
Biodiversity Certified	YES
PB Chemical Certified	NO

*Percent Daily Values are based on an daily average of the equal per capita share for a 7.5 billion population. Annual per capta share listed below

Total Carbon	Less than	0.6gtCO_2
Nitrogen	Less than	8.2kg
Aerosols	Less than	0.1AOD_e
Water	Less than	5.3m^3
Phosphorous	Less than	1.5kg
Landuse	Less than	0.8ha

Planetary Facts labels could be used to disclose the critical environmental impacts of goods and services. Credit: Peter Newman/Kate Meyer, Author provided

Planetary accounting is designed to work at a range of scales. We could use it to inform anything from individual actions, to city planning targets, to corporate sustainability goals, to global environmental negotiations.

It could even be "gamified," perhaps in the form of apps that let players compete with one another to live within their share of global environmental budgets. Or it could be used to draw up "planetary labels" similar to the nutritional information labels that help keep food companies honest and the public informed.

Planetary accounting won't solve all the complex problems our planet faces. But it could make it easier to answer that all-important question: "What can I do to help?"

Provided by The Conversation