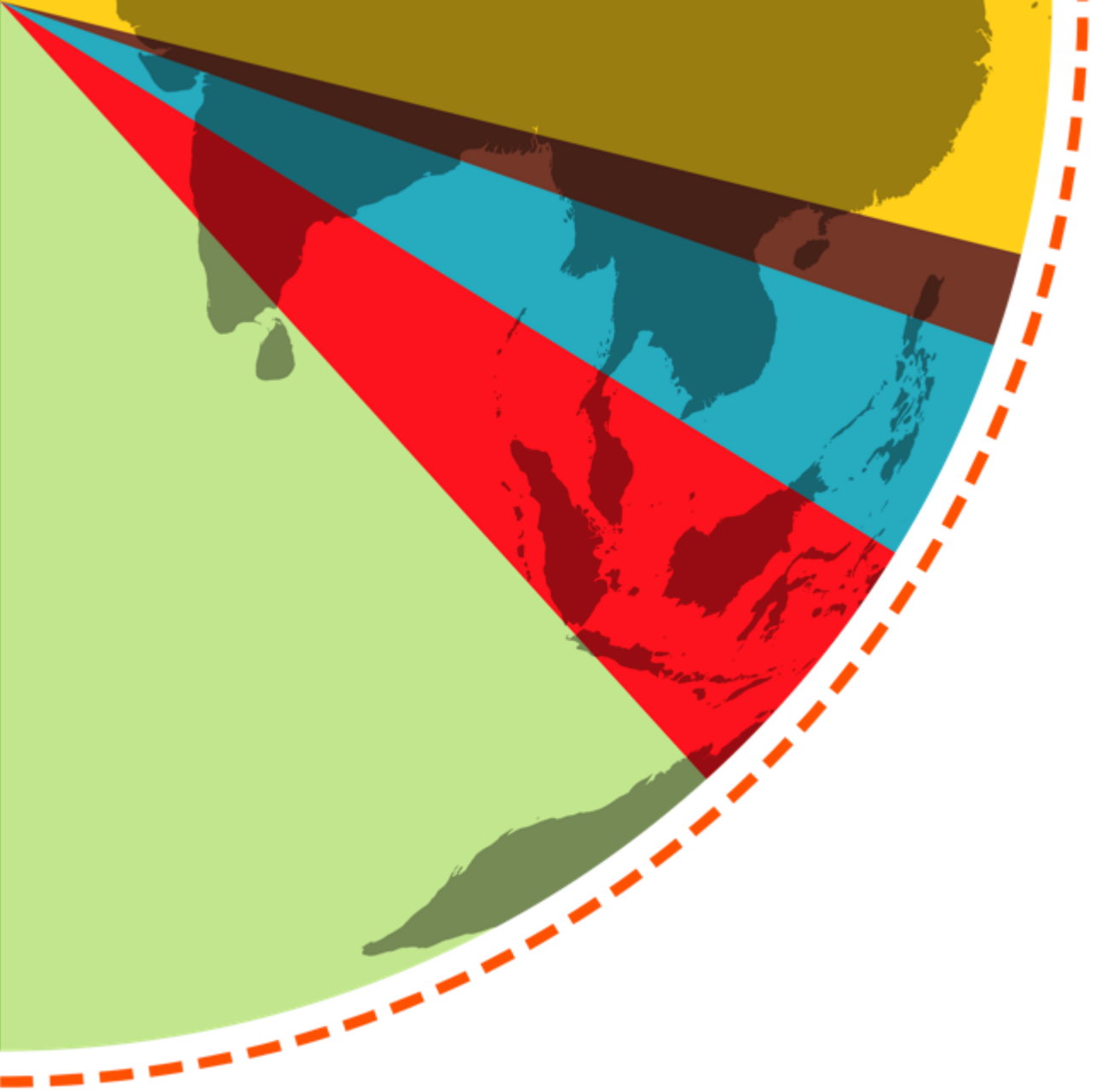


Alliance

CGIAR

Bioversity International

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

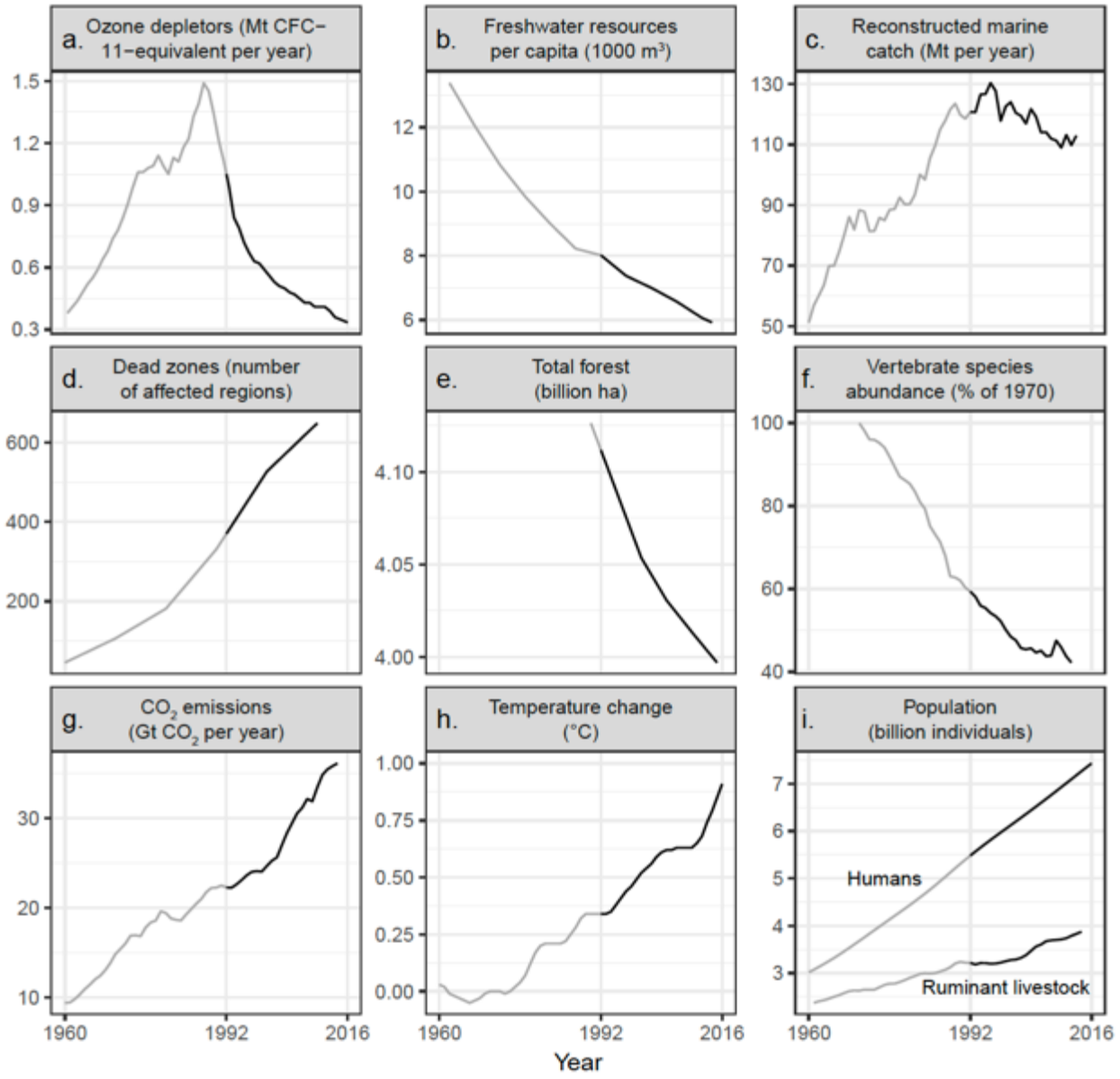
EAT

Planet Proofing the Global Food System

We are not yet bending environmental curves

World Scientists' Warning to Humanity: A Second Notice

WILLIAM J. RIPPLE, CHRISTOPHER WOLF, THOMAS M. NEWSOME, MAURO GALETTI, MOHAMMED ALAMGIR, EILEEN CRIST, MAHMOUD I. MAHMOUD, WILLIAM F. LAURANCE, and 15,364 scientist signatories from 184 countries



The scale of the challenge

2 billion people lack key micronutrients like iron and vitamin A

155 million children are stunted

52 million children are wasted

2 billion adults are overweight or obese

41 million children are overweight

88% of countries face a serious burden of either two or three forms of malnutrition

And the world is off track to meet all global nutrition targets

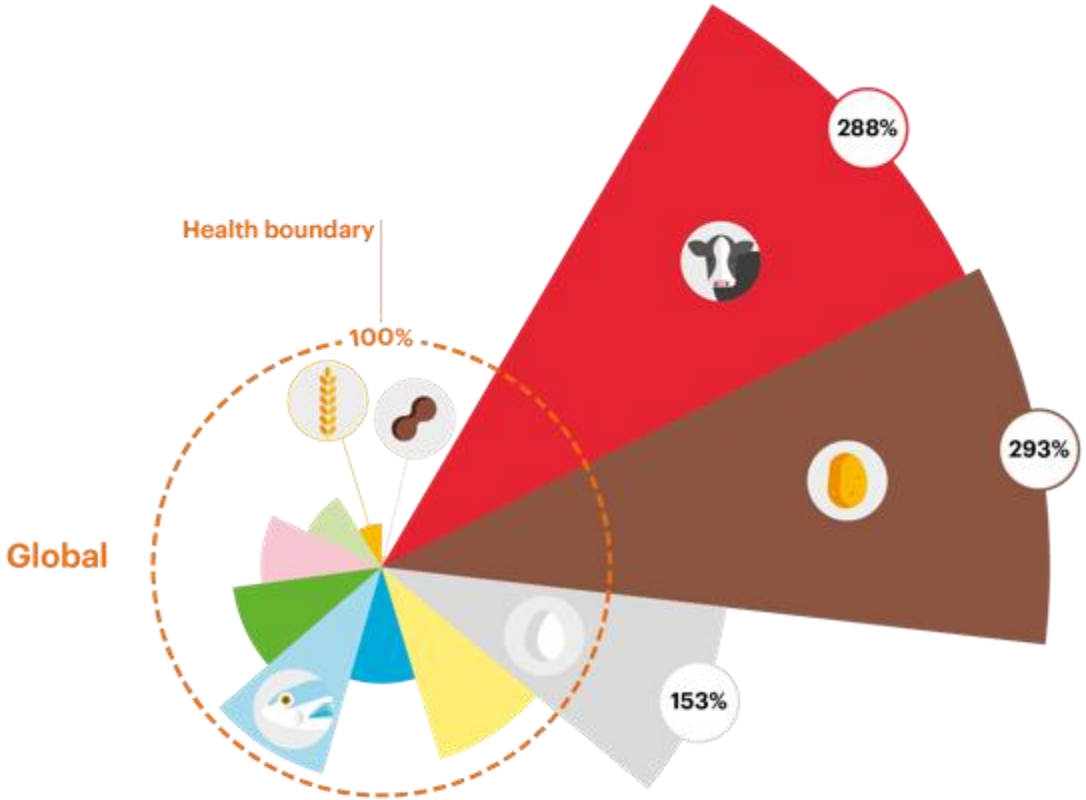
1 Goal – 2 Targets – 5 Strategies

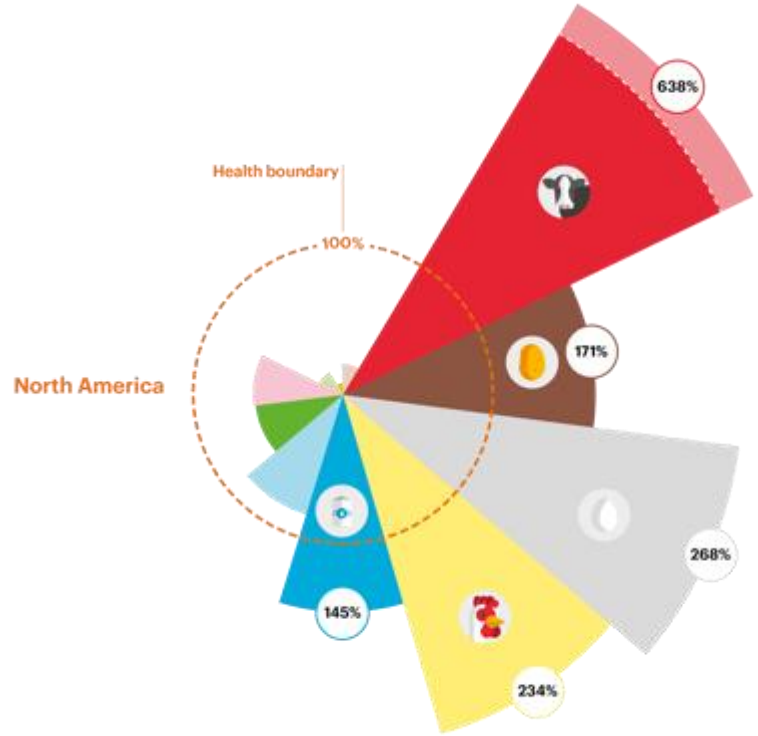
Scientific Targets for Healthy Diets from Sustainable Food Production

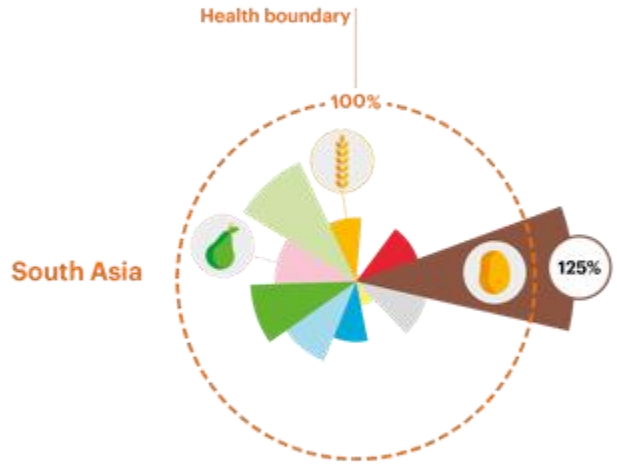
Target 1 – **Healthy Diets**

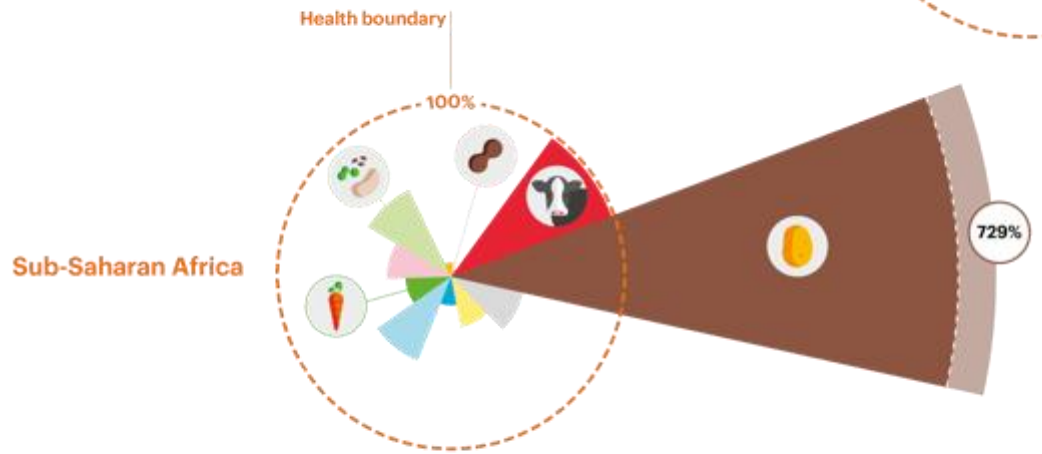
2500 kcal/day

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


Global
Health boundary
100%
288%
293%
153%


North America
Health boundary
100%
638%
171%
268%
145%
234%

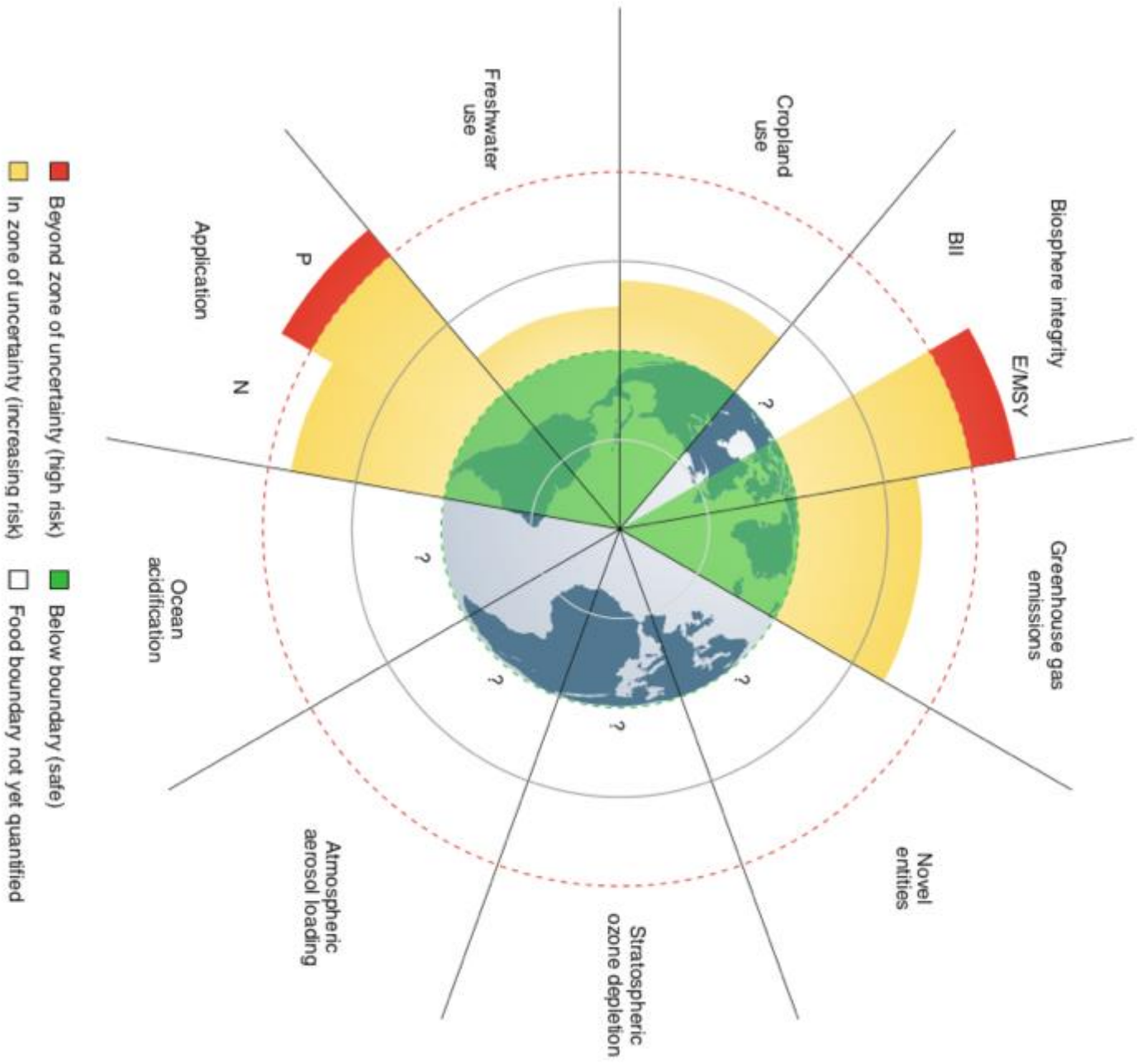

South Asia
Health boundary
100%
125%


Sub-Saharan Africa
Health boundary
100%
729%

Planet-proofing the global food system

Without a great food system transformation, the world will fail to deliver both on the United Nations Sustainable Development Goals and the Paris Climate Agreement. There are five grand challenges to be faced, by science and society, to effect that transformation.

Johan Rockström, Ottmar Edenhofer, Juliana Gaertner and Fabrice DeClerck

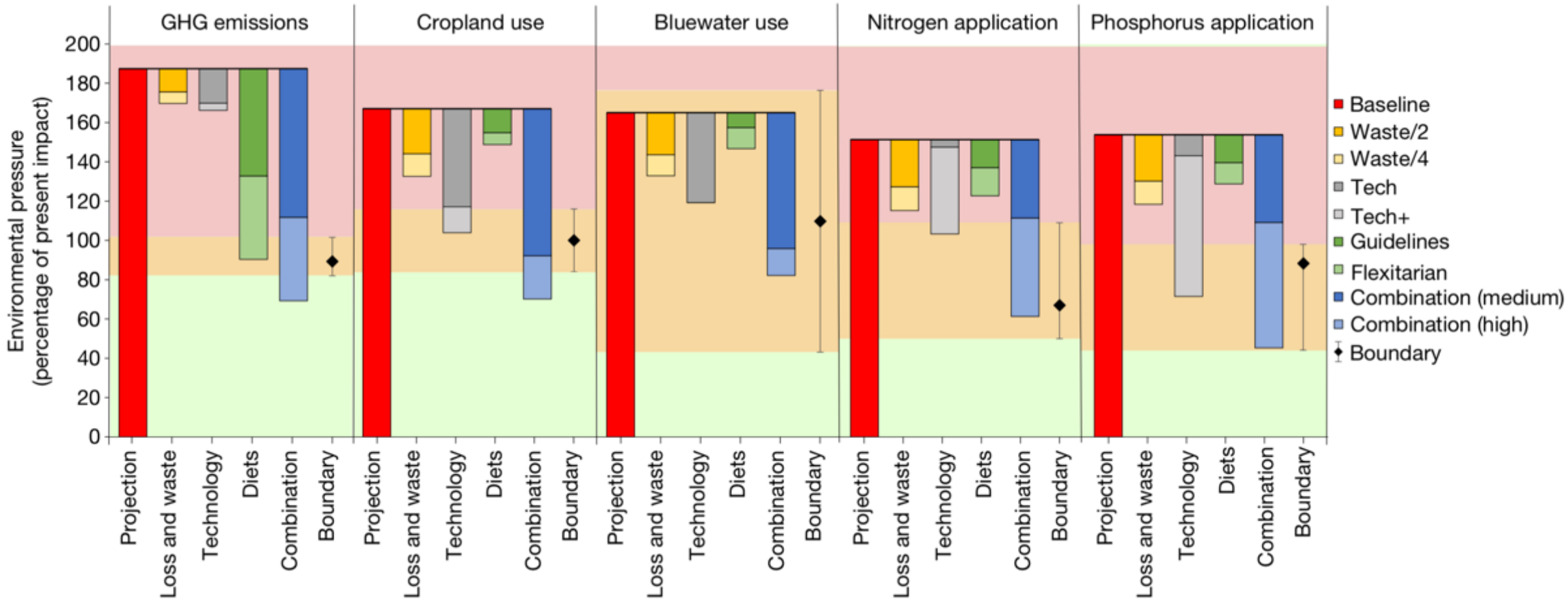


Target 2 – **Sustainable Food Production**

Earth system process	Control variable	Boundary (Uncertainty range)	Global Implication
Climate change	**GHG emissions**	**5 Gt CO_2-eq yr^{-1}** (4.7 – 5.4 Gt CO_2-eq yr^{-1})	No new emissions from Agriculture
Land-system change	**Cropland use**	**13 M km^2** (11–15 M km^2)	0 land expansion
Freshwater use	**Water use**	**2,500 km^3 yr^{-1}** (1000–4000 km^3 yr^{-1})	>30% flows in basins
Nitrogen cycling	**N application**	**90 Tg N yr^{-1}** (65–90 Tg N yr^{-1}) * (90–130 Tg N yr^{-1})**	Pollution <1 – 2.5 mg N L^{-1}
Phosphorus cycling	**P application**	**8 Tg P yr^{-1}** (6–12 Tg P yr^{-1}) * (8–16 Tg P yr^{-1})**	Pollution <50- 100 mg P m^{-3}
Biodiversity loss	**Extinction rate**	**10 E/MSY** (1–80 E/MSY)	50% land intact by ecoregion

1 Goal – 2 Targets – 5 Strategies

Can we feed 10 billion a healthy diet within environmental limits?


GHG emissions
Cropland use
Bluewater use
Nitrogen application
Phosphorus application
Environmental pressure
(percentage of present impact)
0
20
40
60
80
100
120
140
160
180
200
Projection
Loss and waste
Technology
Diets
Combination
Boundary
Baseline
Waste/2
Waste/4
Tech
Tech+
Guidelines
Flexitarian
Combination (medium)
Combination (high)
Boundary

1 Goal – 2 Targets – 5 Strategies

Five Strategies for a Great Food Transformation

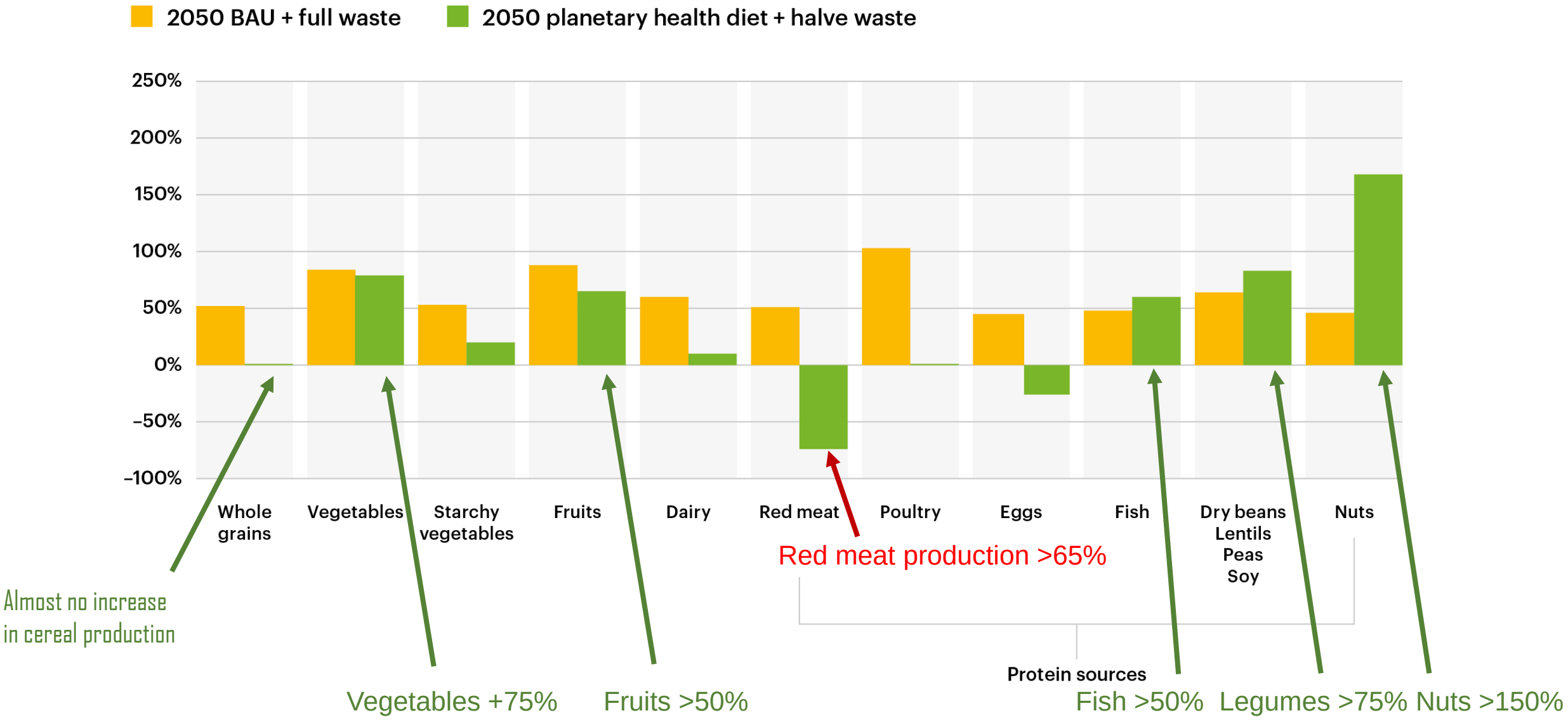
Strategy 1

Seek international and national commitment to shift towards healthy diets

Strategy 2

Reorient agricultural priorities from producing high quantities of food to producing healthy food

Change in Food Production



Strategy 3

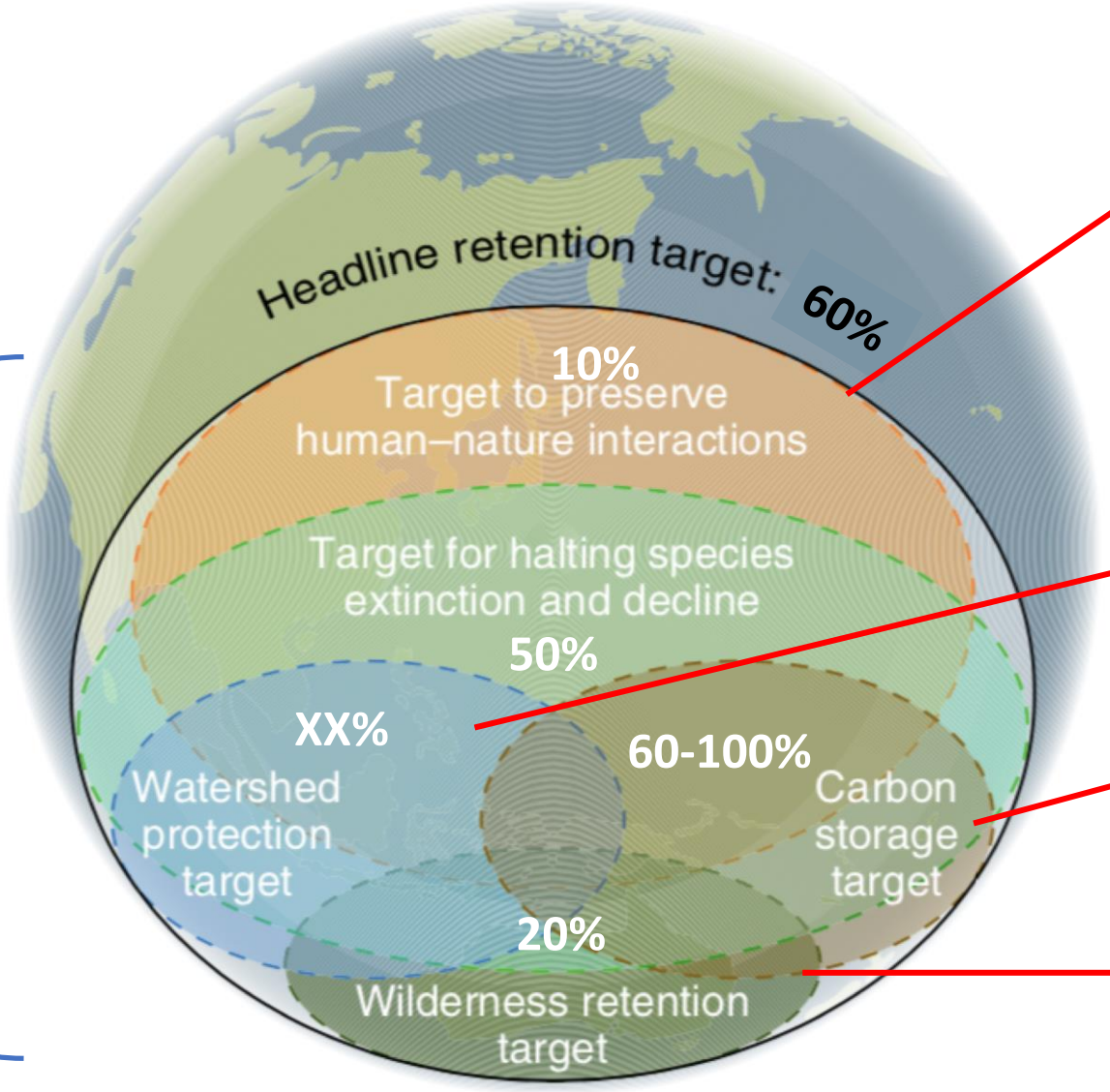
Sustainably intensify food production to increase high-quality output

Strategy 4

Strong and coordinated governance of land and oceans

4

Alignment with Aichi



Target 12: Species Loss

60% ≥ *p* + *i* + *r* + *a*

Target 7: Agriculture

Target 8: Pollution
(preliminary in NP target)

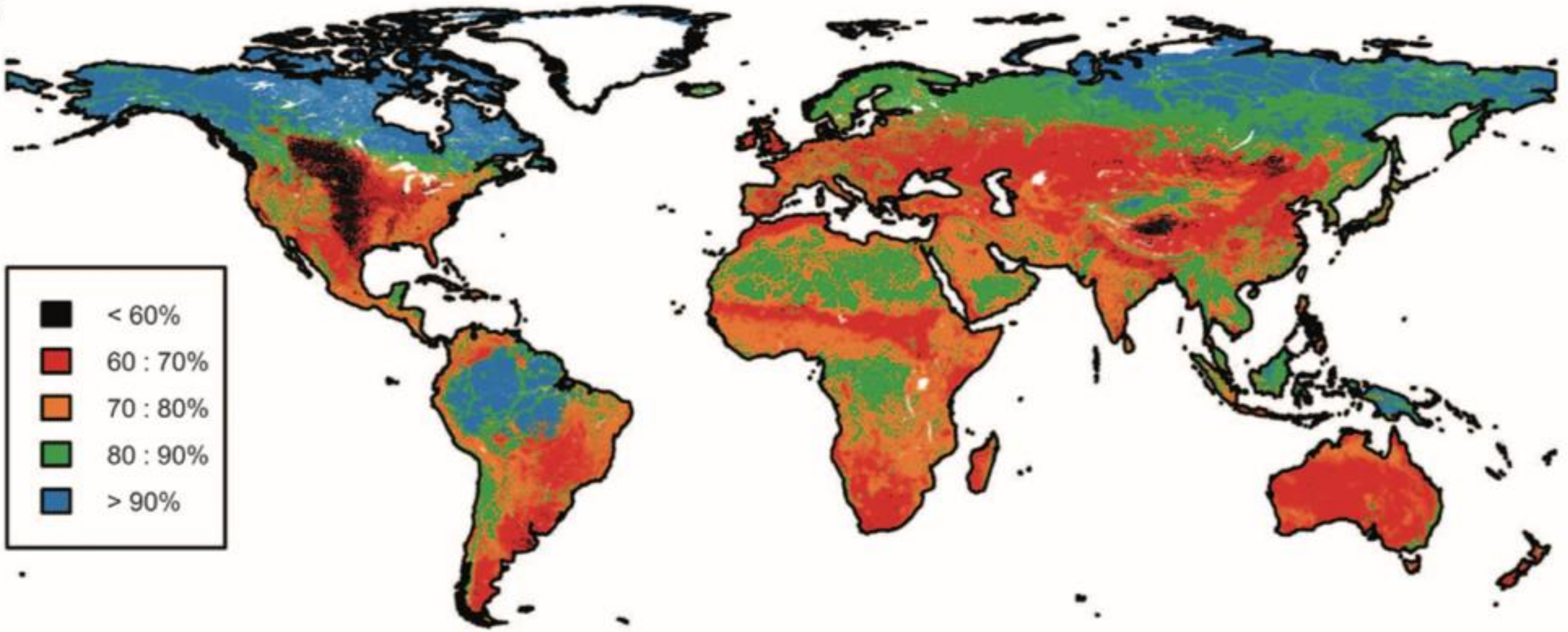
Target 14: Water and ES
(note impact of freshwater target)

Target 15: Carbon Stocks

Target 11: 17% protected

Has land use pushed terrestrial biodiversity beyond the planetary boundary? A global assessment

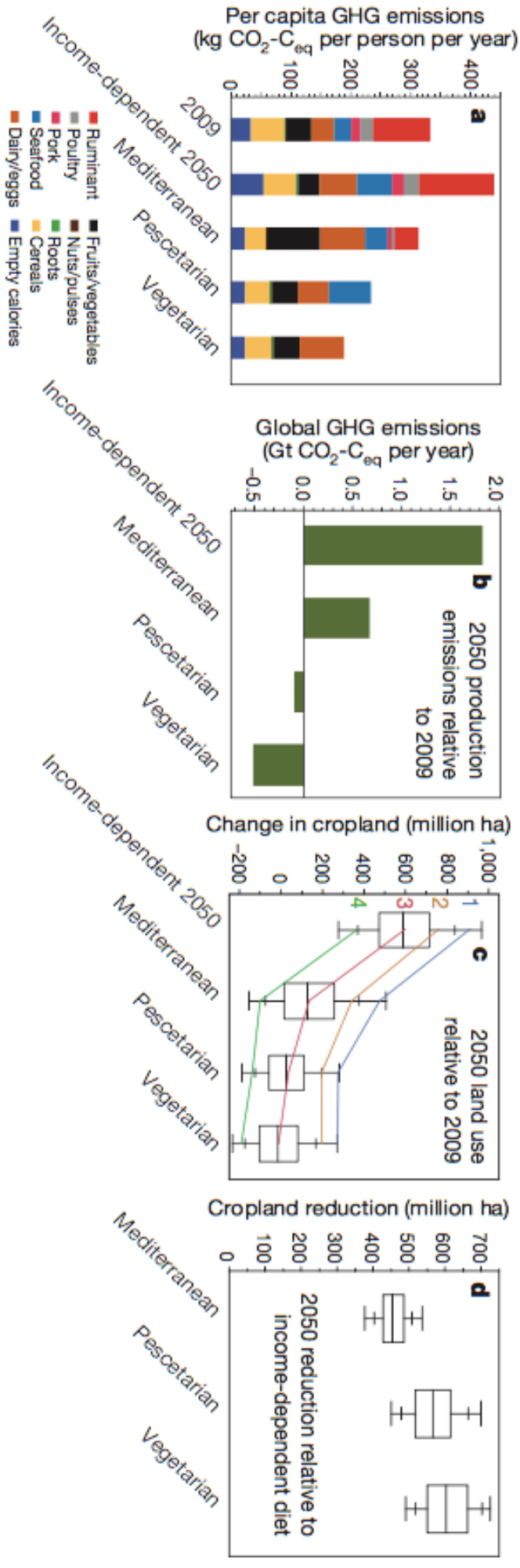
B



Tim Newbold,[1,2*] Lawrence N. Hudson,[3] Andrew P. Arnell,[1] Sara Contu,[3] Adriana De Palma,[3,4] Simon Ferrier,[5] Samantha L. L. Hill,[1,3] Andrew J. Hoskins,[5] Igor Lysenko,[4] Helen R. P. Phillips,[3,4] Victoria J. Burton,[3] Charlotte W. T. Chng,[3] Susan Emerson,[3] Di Gao,[3] Gwilym Pask-Hale,[3] Jon Hutton,[1,6] Martin Jung,[7,8] Katia Sanchez-Ortiz,[3] Benno I. Simmons,[3,4] Sarah Whitmee,[2] Hanbin Zhang,[3] Jörn P. W. Scharlemann,[1,8] Andy Purvis[3,4]

Global diets link environmental sustainability and human health

David Tilman[1,2] & Michael Clark[1]

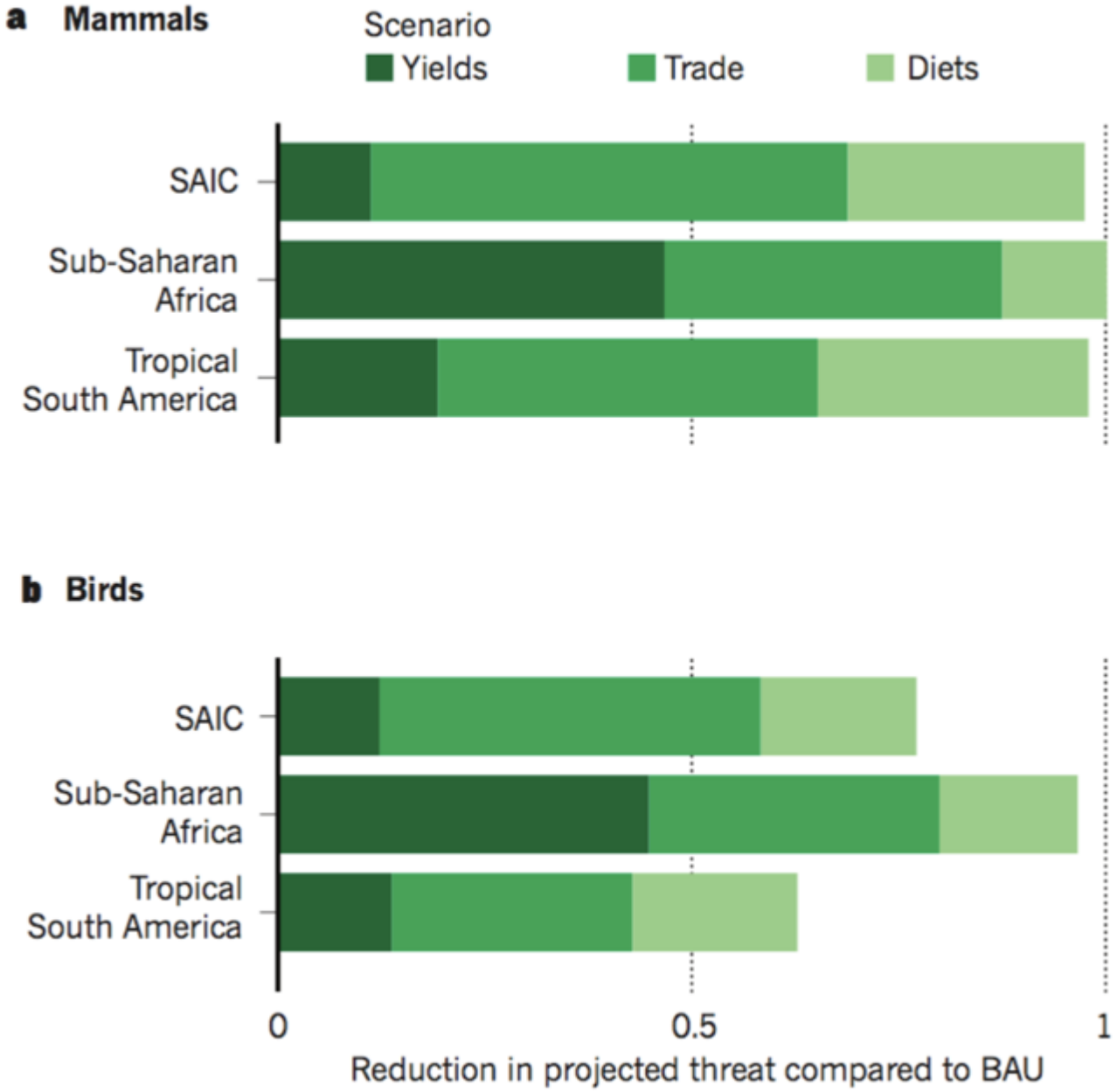


doi:10.1038/nature22900

REVIEW

Future threats to biodiversity and pathways to their prevention

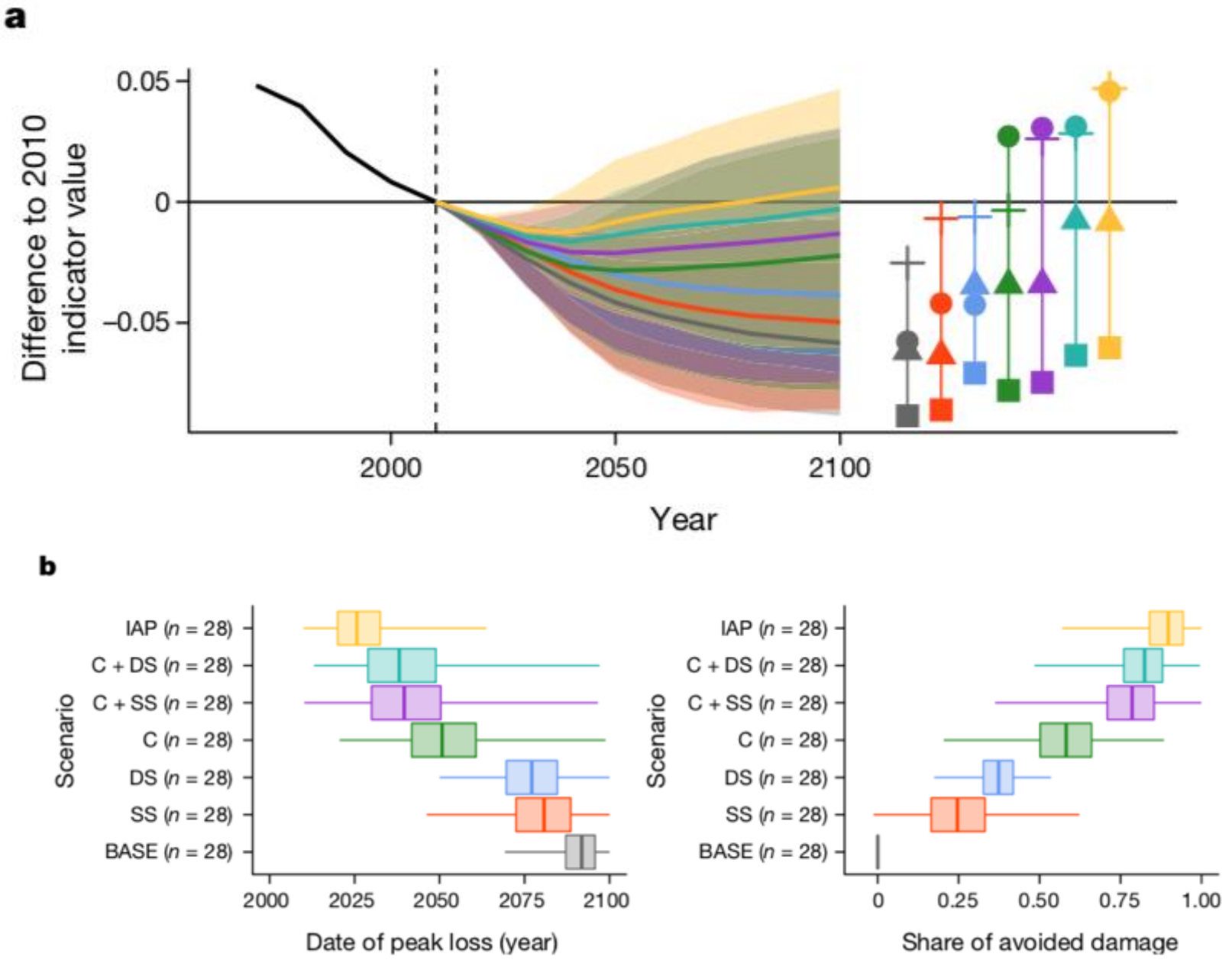
David Tilman[1,2], Michael Clark[3], David R. Williams[2], Kaitlin Kimmel[1], Stephen Polasky[1,4] & Craig Packer[1,5,6]



nature
International weekly journal of science

Article

Bending the curve of terrestrial biodiversity needs an integrated strategy



An Ecoregion-Based Approach to Protecting Half the Terrestrial Realm

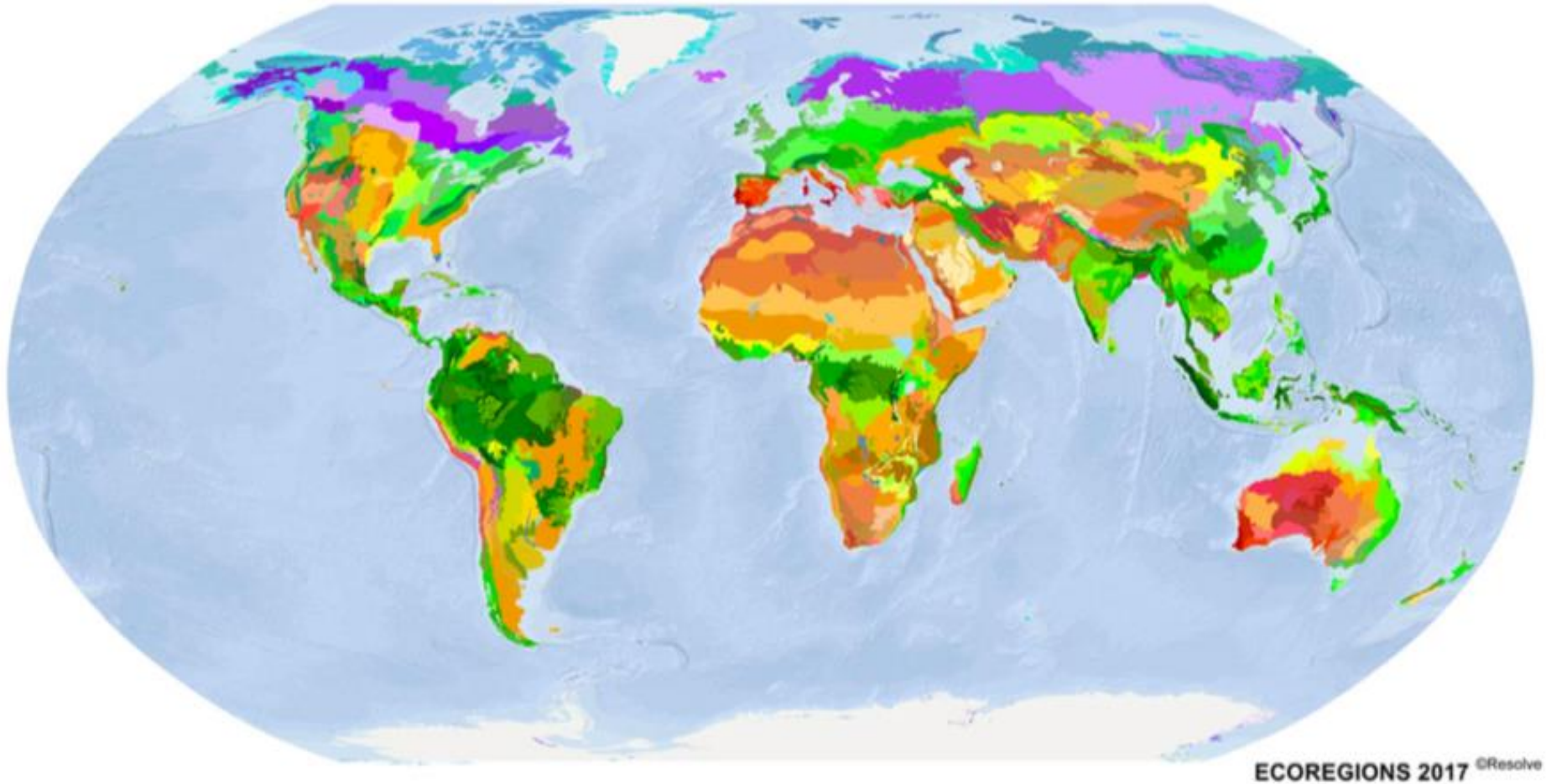
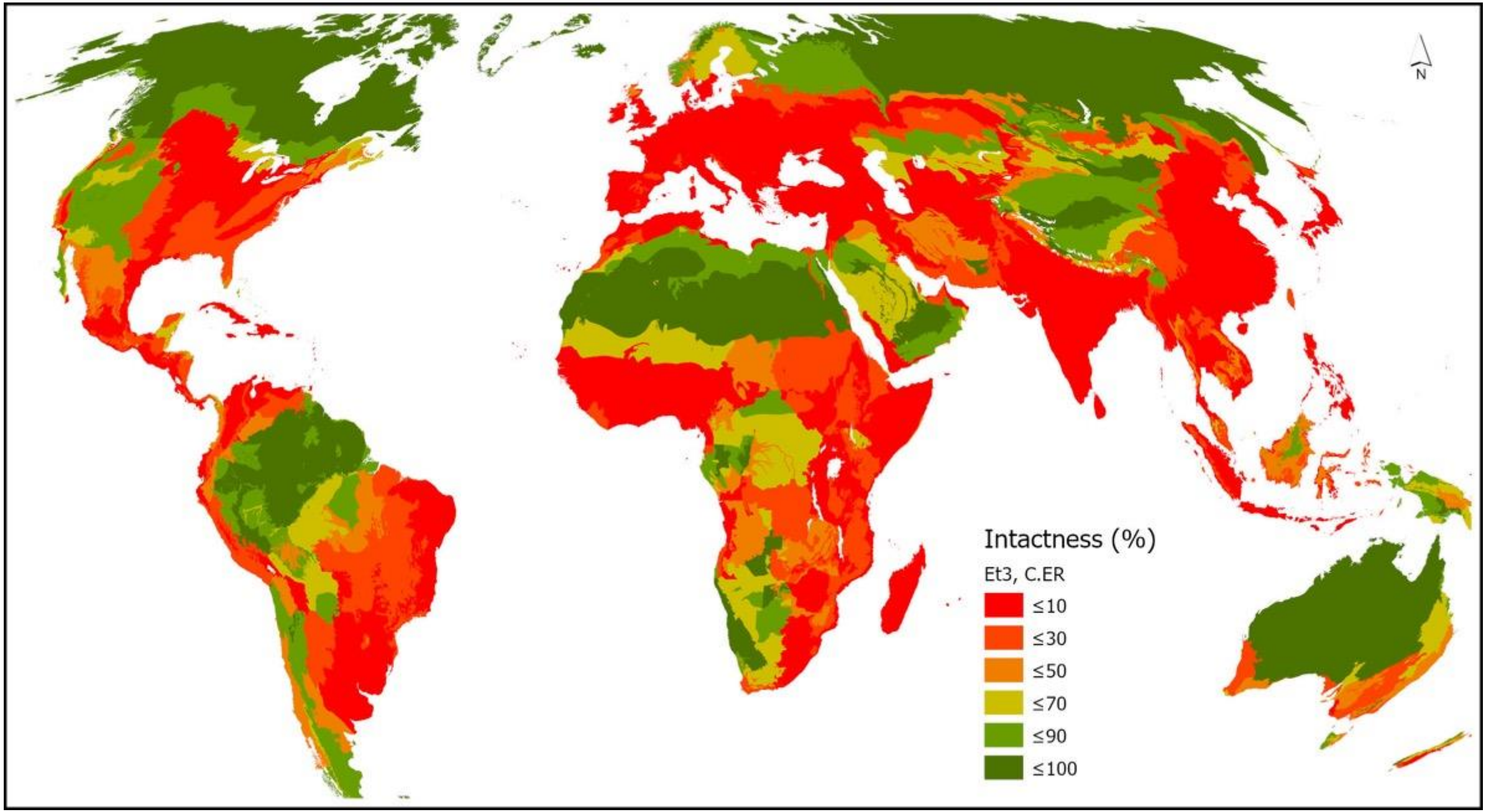


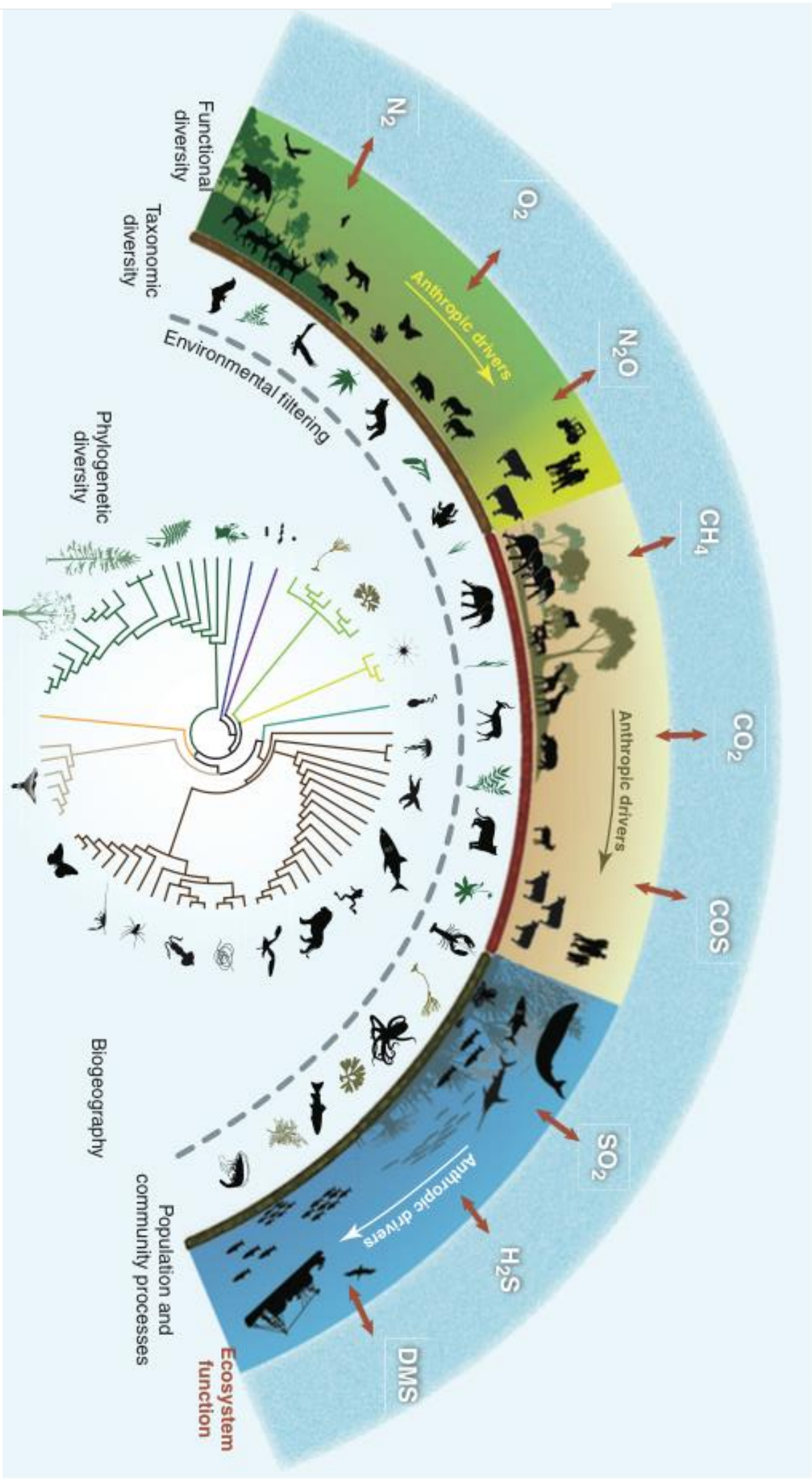
Figure 1. The 846 global ecoregions that comprise Ecoregions2017©Resolve nested within 14 terrestrial biomes. An interactive map is available at ecoregions2017.appspot.com. (A companion biome map is presented in supplemental appendix S1, supplemental figure S1).


N
Intactness (%)
Et3, C.ER
≤10
≤30
≤50
≤70
≤90
≤100

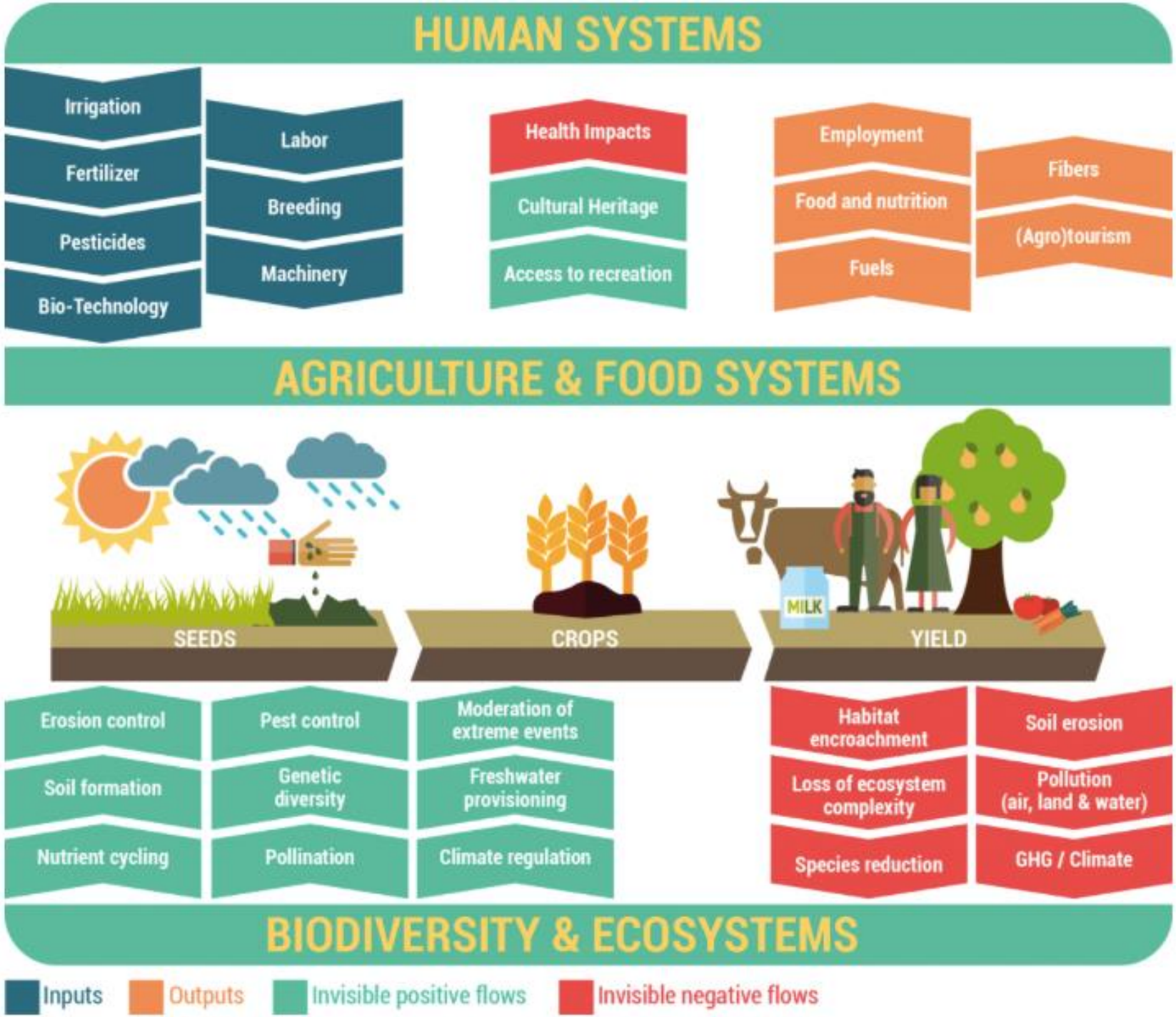
The Functions of Biological Diversity in an Age of Extinction

Shahid Naeem,[1]* J. Emmett Duffy,[2] Erika Zavaleta[3]

www.sciencemag.org SCIENCE VOL 336 15 JUNE 2012



TEEBAgFood, 2015

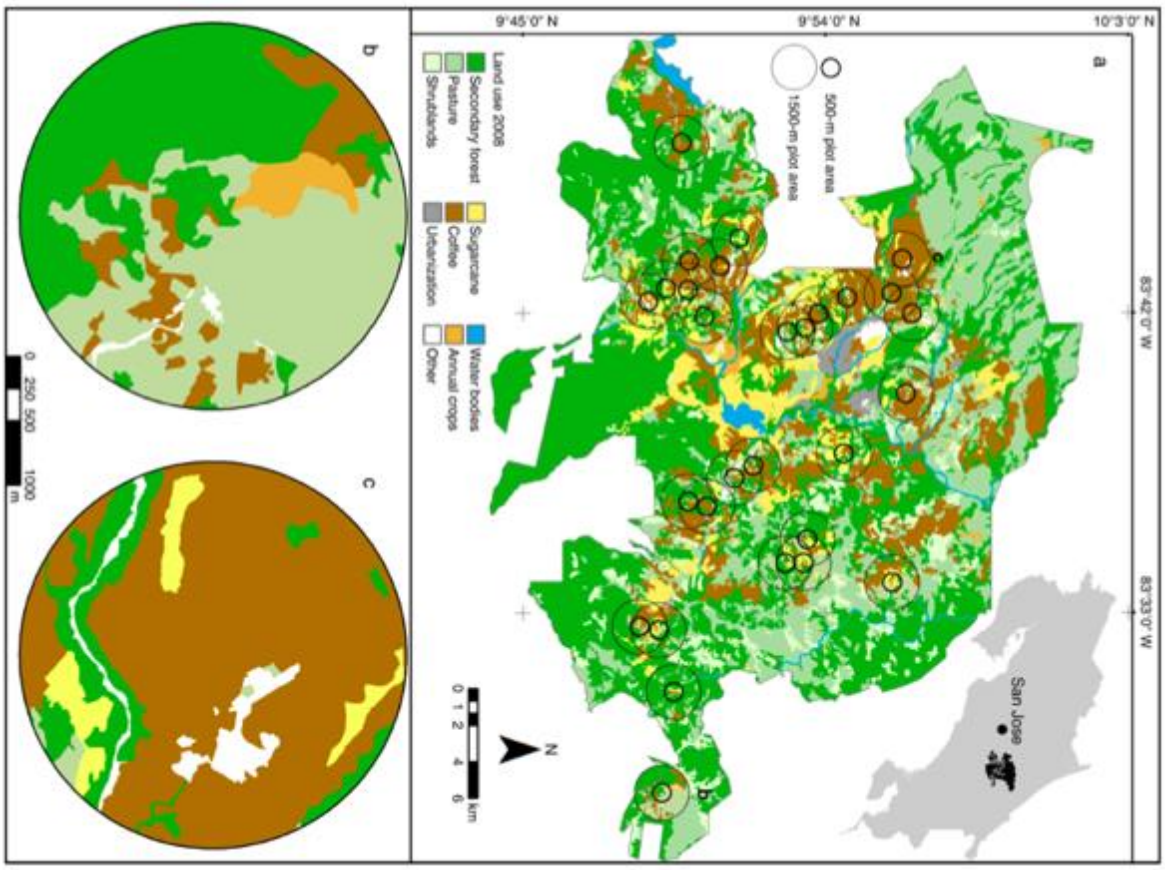


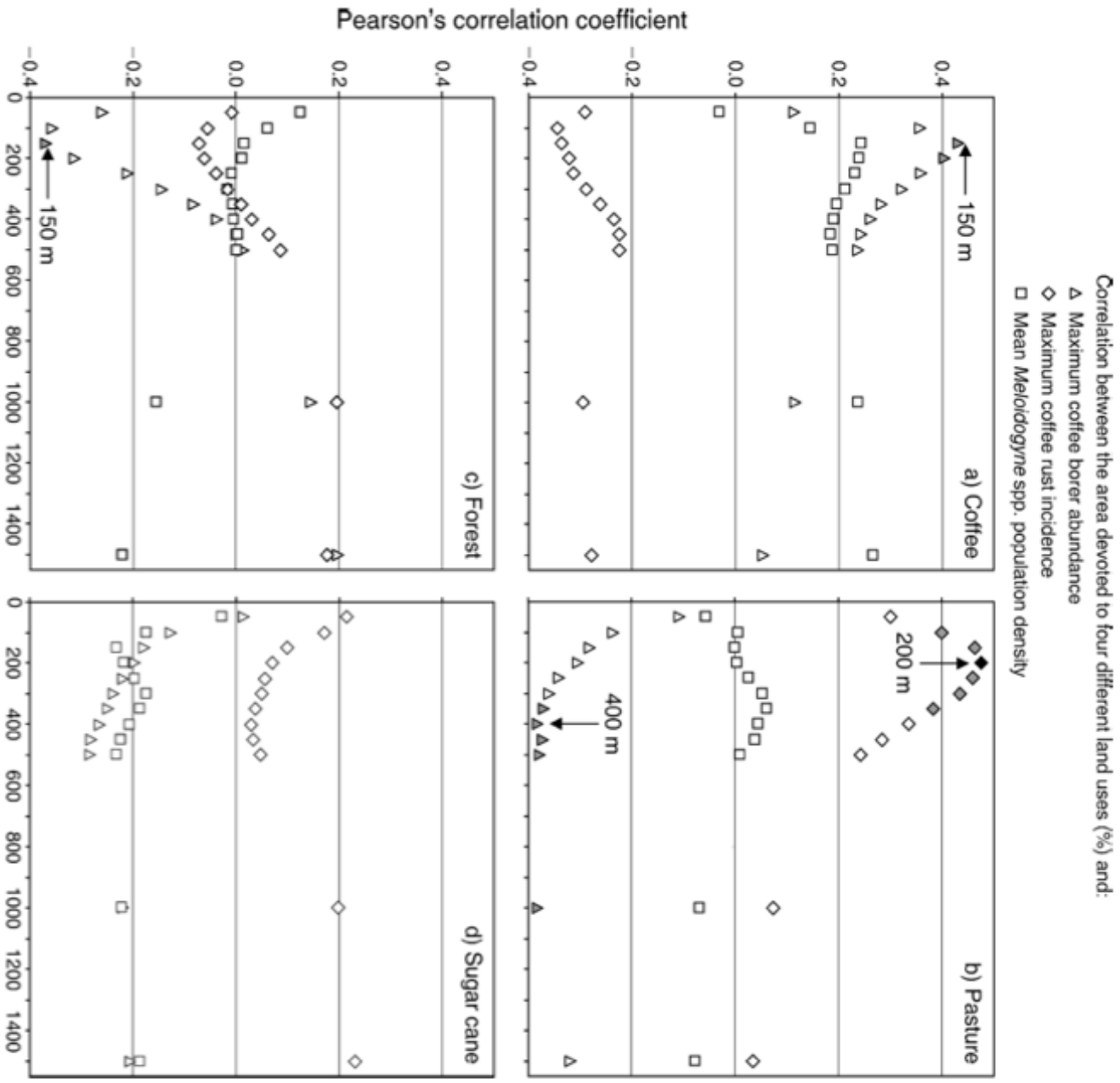

Cipriano Ribera
Nicaragua
Jacques Avelino
France
1

Ecological Applications, 22(2), 2012, pp. 584–596

Landscape context and scale differentially impact coffee leaf rust, coffee berry borer, and coffee root-knot nematodes

JACQUES AVELINO,[1,2,3,5] ALÍ ROMERO-GURDIÁN,[2] HÉCTOR F. CRUZ-CUELLAR,[2,4] AND FABRICE A. J. DECLERCK[2]

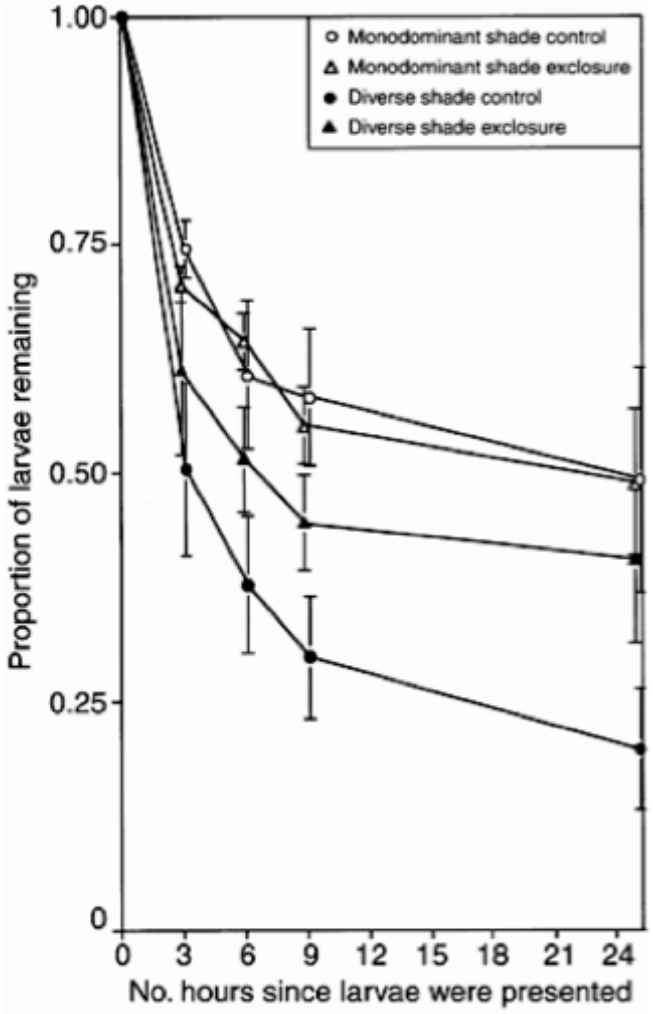




Evidence for a biodiversity and function relationship

Pest Control

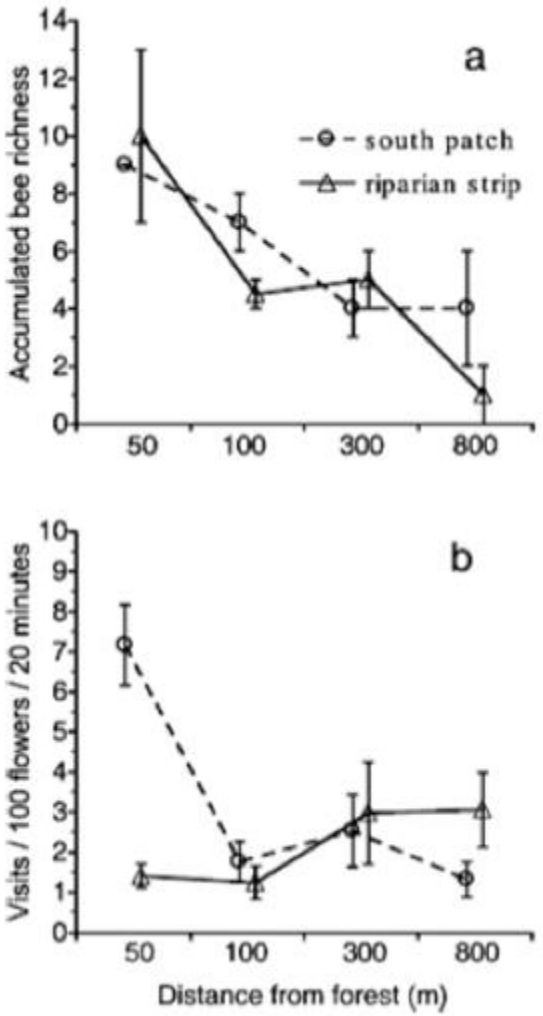
Perfecto et al. 2004



Agroforest stucture

Pollination

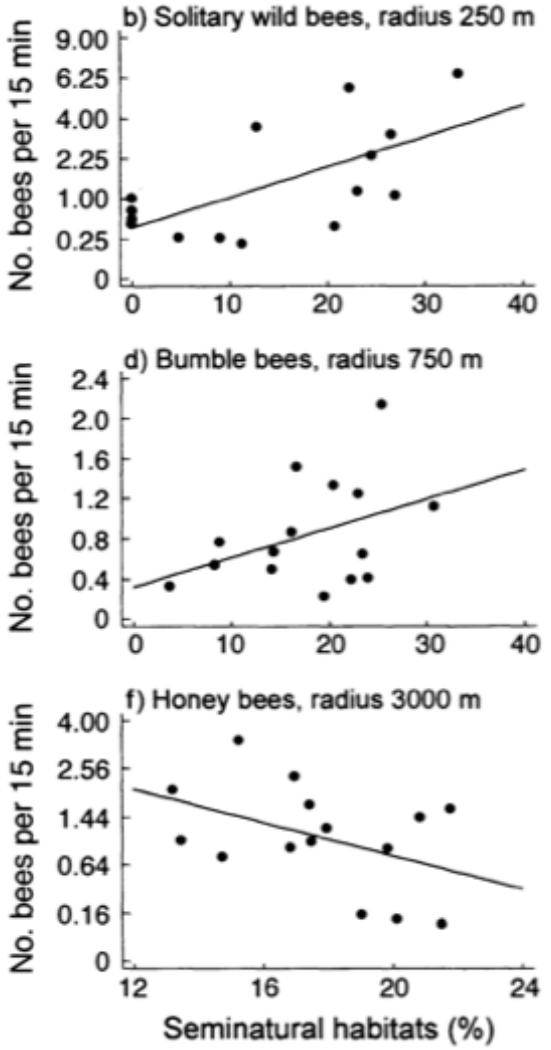
Ricketts et al. 2004



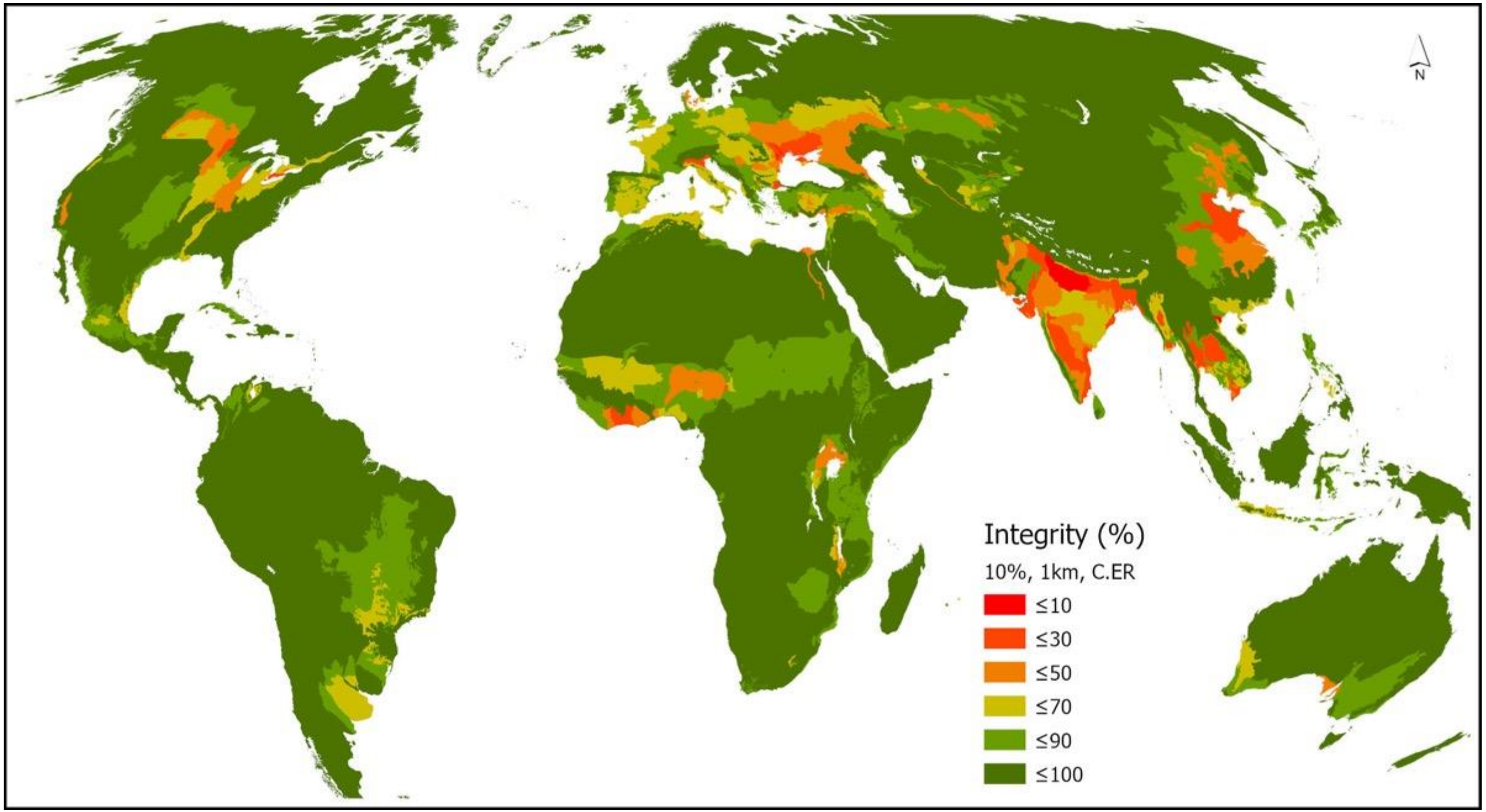
Distance from forest

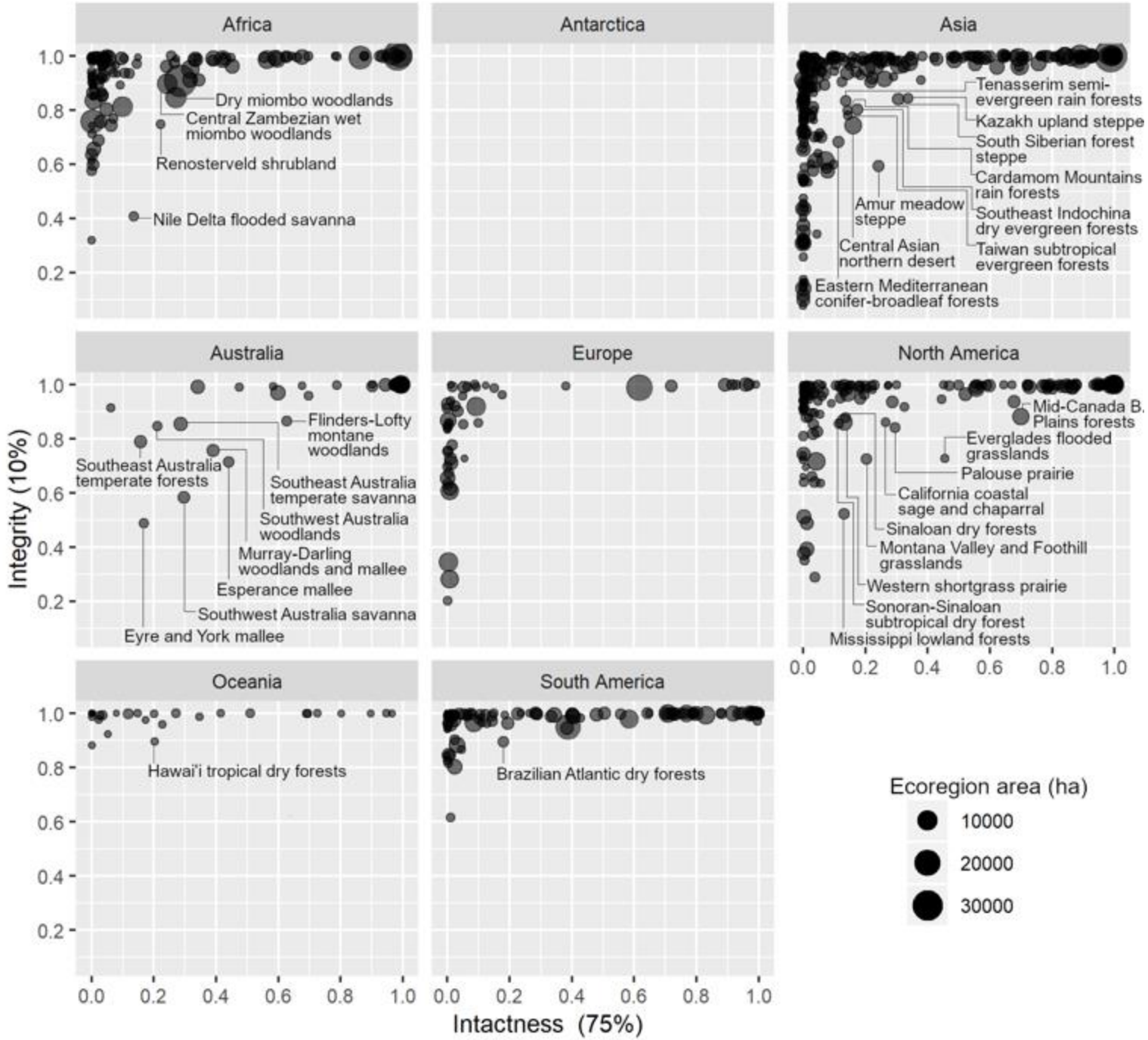
Pollination

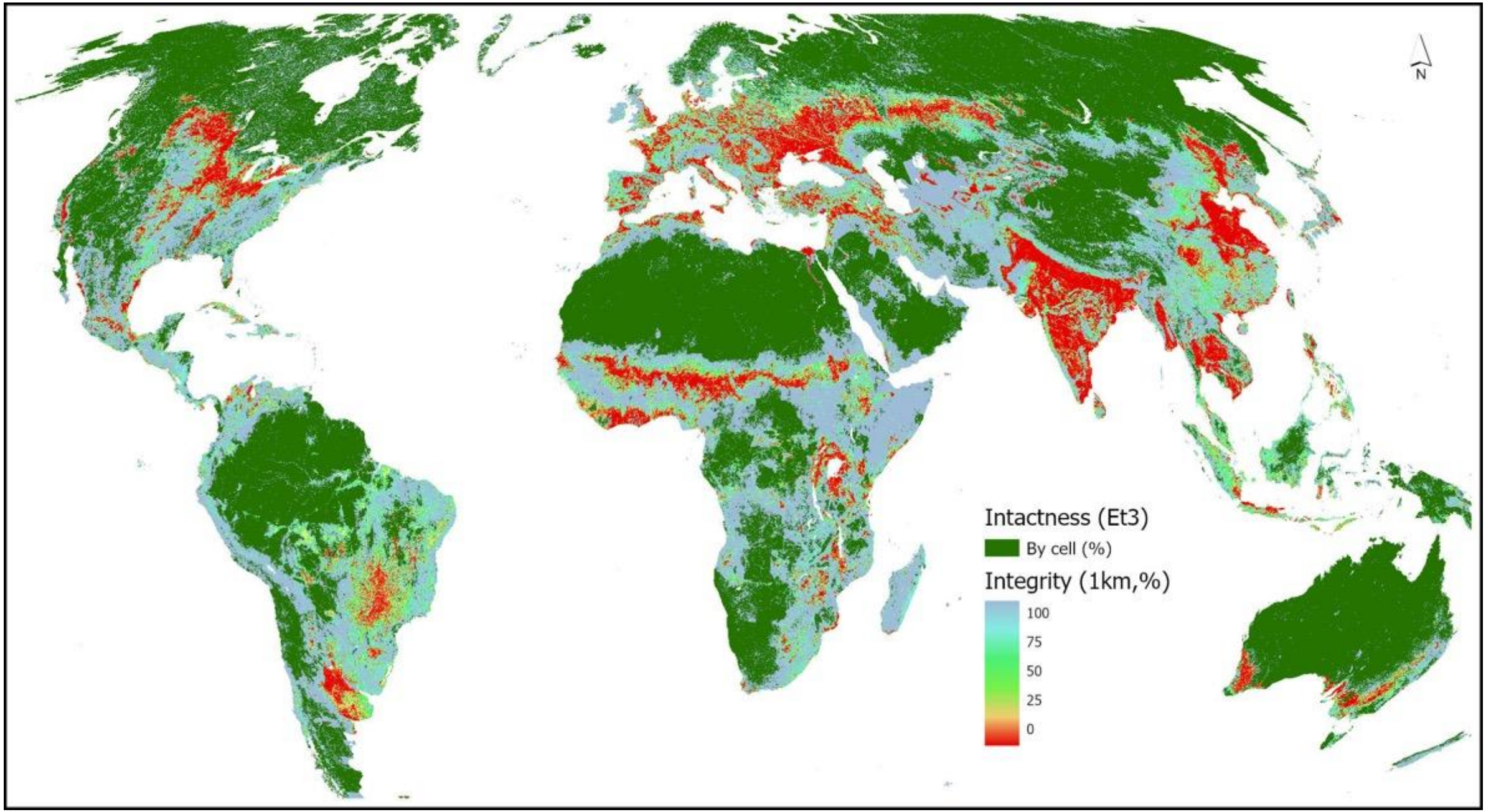
Steffan-Dewenter et al. 2002



Seminatural habitat (%)


N
Integrity (%)
10%, 1km, C.ER
≤10
≤30
≤50
≤70
≤90
≤100


Africa
Antarctica
Asia
Australia
Europe
North America
Oceania
South America
Dry miombo woodlands
Central Zambezian wet miombo woodlands
Renosterveld shrubland
Nile Delta flooded savanna
Tenasserim semi-evergreen rain forests
Kazakh upland steppe
South Siberian forest steppe
Cardamom Mountains rain forests
Amur meadow steppe
Southeast Indochina dry evergreen forests
Central Asian northern desert
Taiwan subtropical evergreen forests
Eastern Mediterranean conifer-broadleaf forests
Flinders-Lofty montane woodlands
Southeast Australia temperate forests
Southeast Australia temperate savanna
Southwest Australia woodlands
Murray-Darling woodlands and mallee
Esperance mallee
Southwest Australia savanna
Eyre and York mallee
Mid-Canada B. Plains forests
Everglades flooded grasslands
Palouse prairie
California coastal sage and chaparral
Sinaloan dry forests
Montana Valley and Foothill grasslands
Western shortgrass prairie
Sonoran-Sinaloan subtropical dry forest
Mississippi lowland forests
Hawai'i tropical dry forests
Brazilian Atlantic dry forests
Integrity (10%)
Intactness (75%)
0.0
0.2
0.4
0.6
0.8
1.0
Ecoregion area (ha)
10000
20000
30000


N
Intactness (Et3)
By cell (%)
Integrity (1km,%)
100
75
50
25
0

Questions to F De Clerck

- What future agricultural land cover change might be compatible with a safe operating space?
  - No-expansion (at global scale) vs. Half-Earth (at ecoregion level) may lead to quite some redistribution?
  - How may reduced consumption of livestock products impact grassland and cropland?

- What agricultural practices might be compatible with a safe operating space?
  - What is the role of organic production practices?
  - What other production practices may be available?
  - How is nutrient input (N, P) framed across a range of different practices?

Strategy 5

At least halve food losses and waste, in line with UN Sustainable Development Goals

Dietary changes from current diets to healthy diets are likely to substantially benefit human health, averting about 11.0 million premature deaths per year, a reduction of about 20%.

Feeding 10 billion people a healthy diet within safe planetary boundaries is possible and will improve the health and well being of millions of people and allow us to pass onto our children a viable planet.