Introduction

Ecological Footprint Concepts and The National Footprint Accounts (NFA)

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Global Footprint Network
Advancing the Science of Sustainability

Outline


1. Introduction/Background
    - Ecological Footprint Concept
    - National Footprint Accounts (NFA)
2. Global Trends & Results

Background Sustainability and Ecology Concepts

Sustainable development *"meets the needs of the present without compromising the ability of future generations to meet their own needs."*

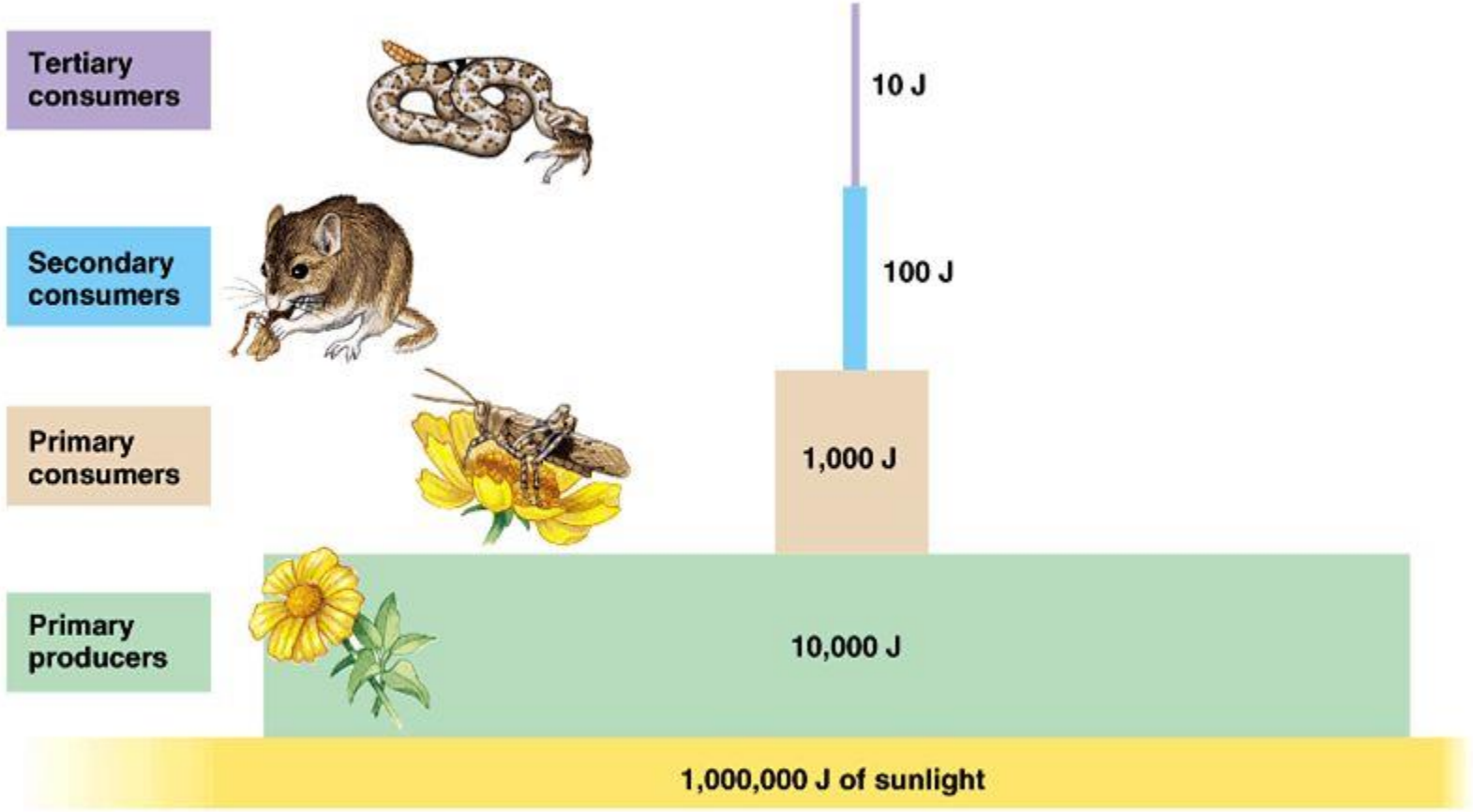
-Brundtland Commission, 1987

After almost 40 years of global discussion we are still not able to address Sustainability

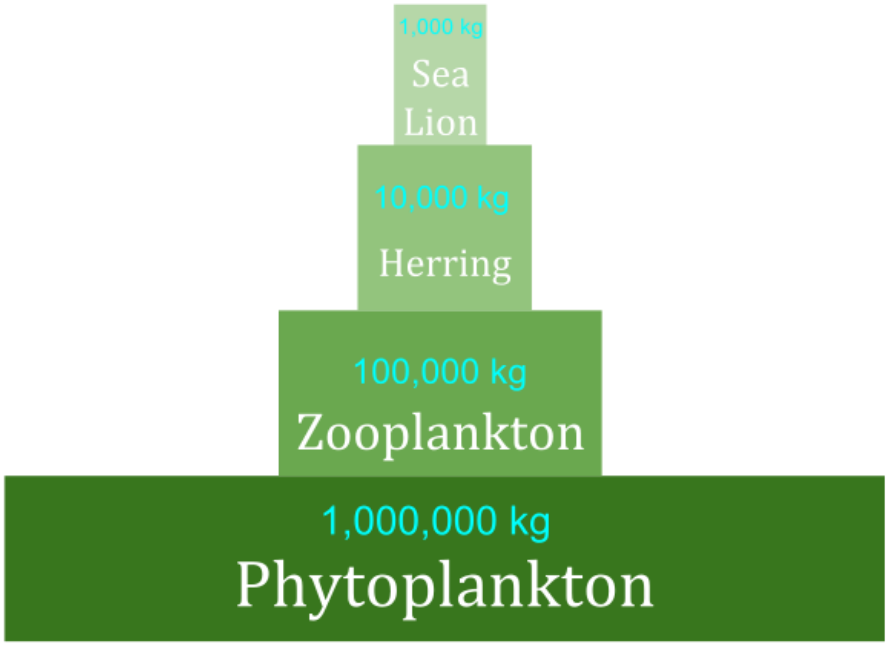
We live on
spaceship Earth.


Our life support systems are solar powered.

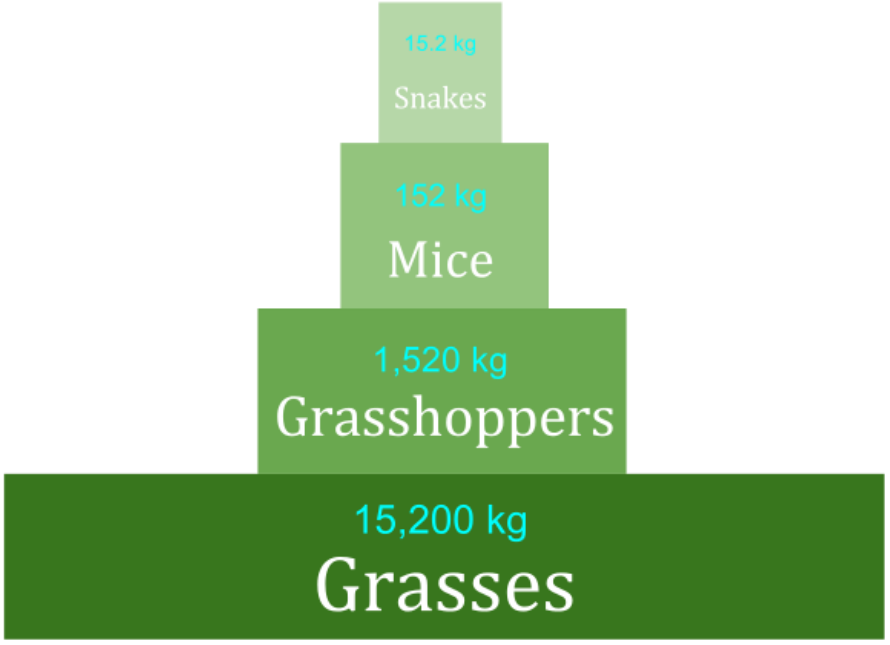
Pyramid of Energy



- Energy Flow begins with **PRIMARY PRODUCTIVITY**, the amount of light energy converted to chemical energy (stored in organic molecules) by an ecosystem's autotrophs over a given period of time via the process of PHOTOSYNTHESIS.



Aquatic Ecosystem



Terrestrial Ecosystem

Context:
Earth’s bioproductive ability is the limiting factor
Human life / economies

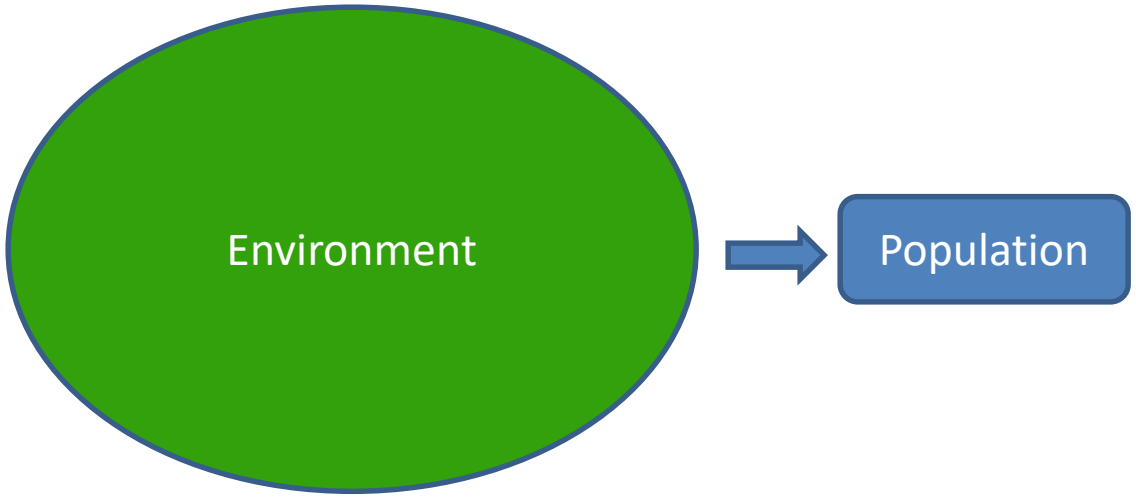
How much productive area is available on Earth?

12.2 billion hectares

1.6 hectares
(per person)

Concept: Carrying Capacity

Carrying capacity is the maximum number, density, or biomass of a population that a specific area can support.



What size population does an environment support?

Carrying capacity for humans?

Assumptions (problems):

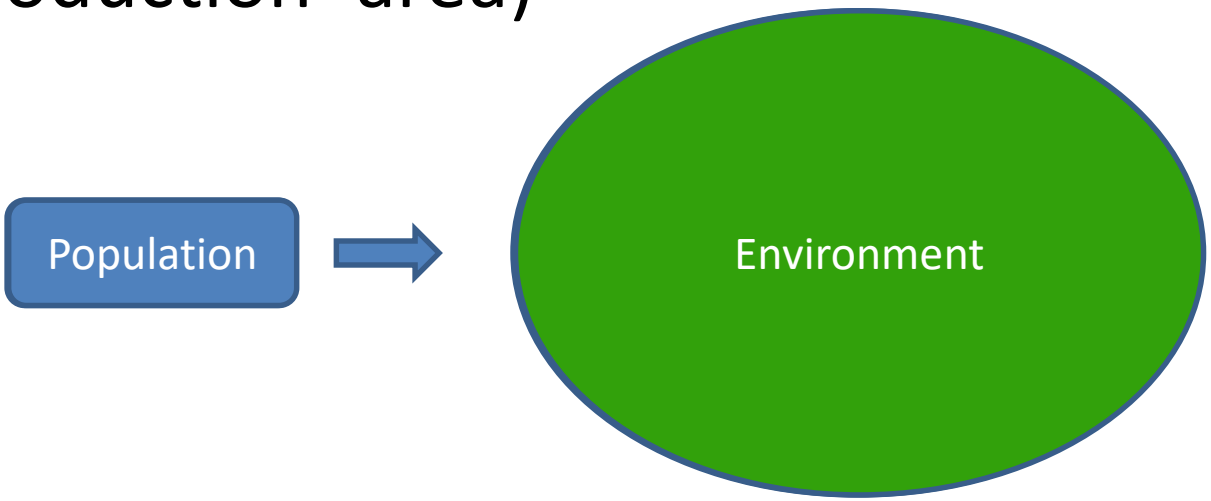
- Defined minimum human consumption requirement
- Steady state environment (time element)

Relevance is limited

Operationalizing the concept of carrying capacity

Remove Assumptions:

- Actual consumption (area required)
- Actual environment measures (production*area)



How much environment does a population demand?

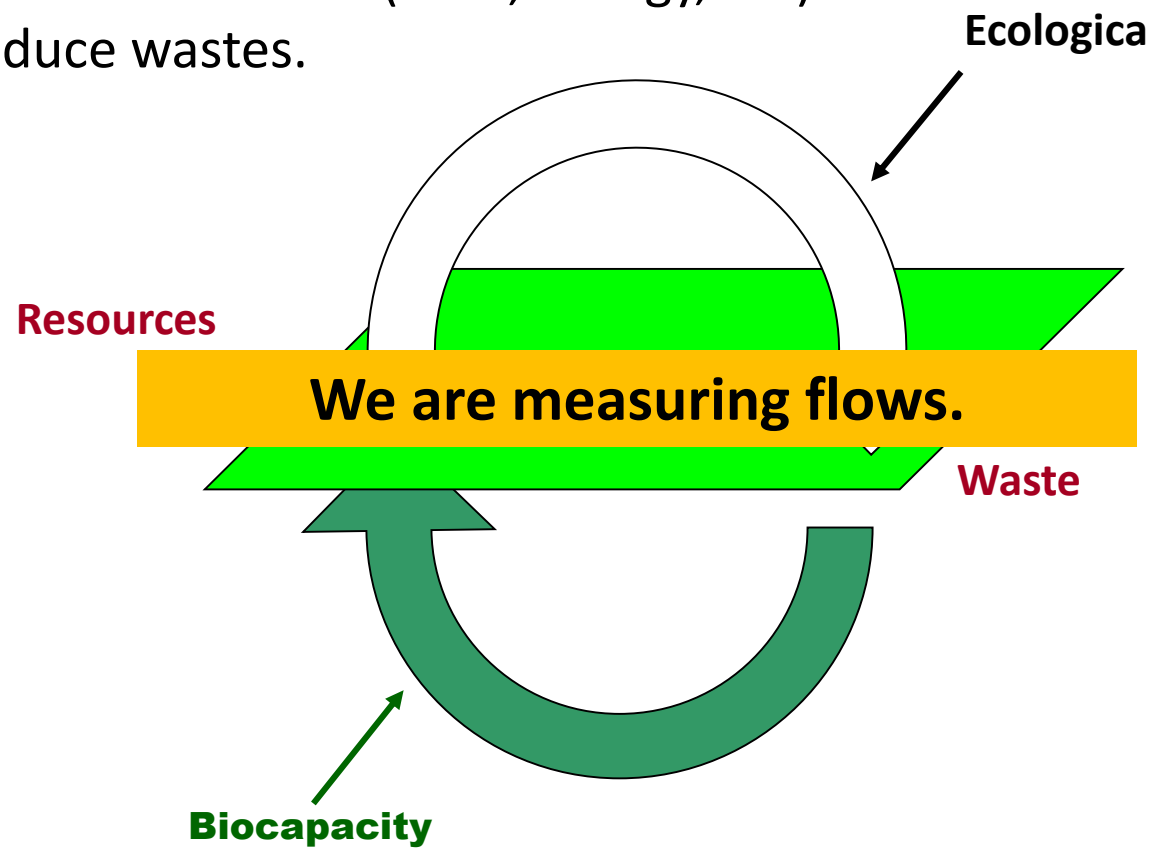
Ecological Footprint Accounting


Underlying Principles

- We cannot take more than can be regenerated
- We cannot create more waste than can be assimilated.

Ecological Footprint Accounting

Societies use resources (food, energy, etc) and produce wastes.



Nature turns wastes back into resources

A Concept, Convention, and Dataset

Concept

The Ecological Footprint Concept
(Wackernagel and Rees 1996)

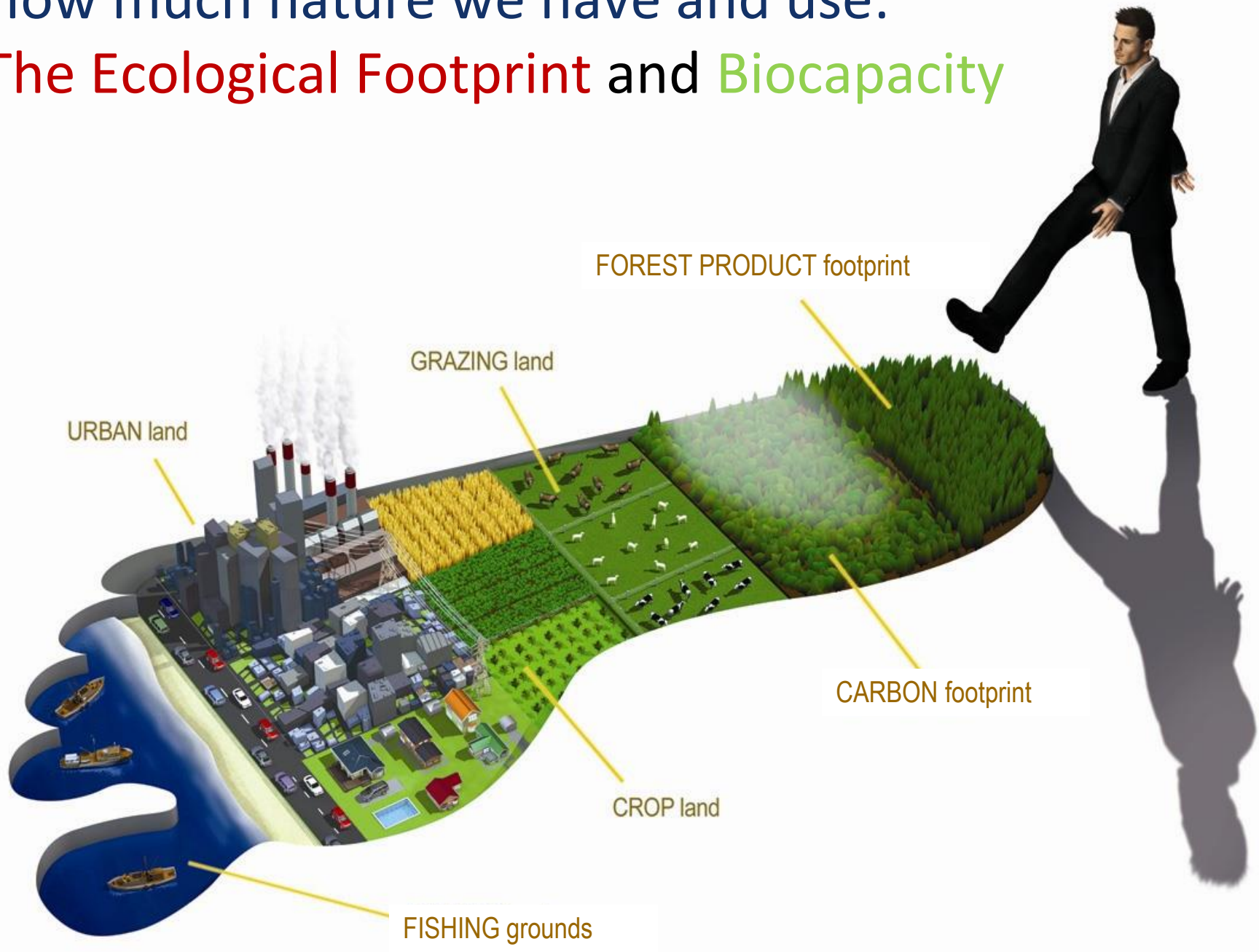
+

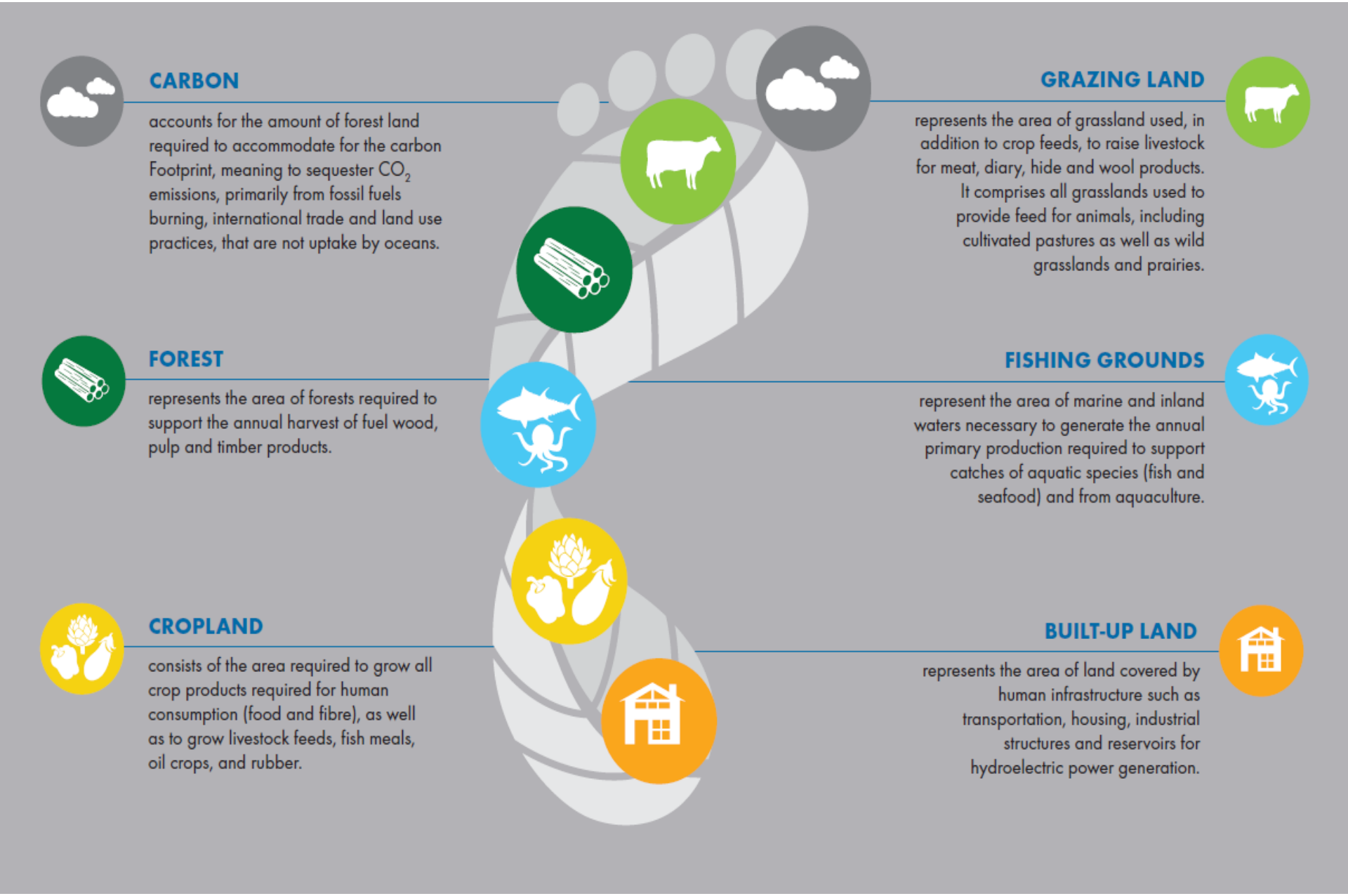
Convention

Methodology to calculate Ecological Footprint

= The National Footprint Accounts

How much nature we have and use:
The Ecological Footprint and Biocapacity




CARBON
accounts for the amount of forest land required to accommodate for the carbon Footprint, meaning to sequester CO_2 emissions, primarily from fossil fuels burning, international trade and land use practices, that are not uptake by oceans.
GRAZING LAND
represents the area of grassland used, in addition to crop feeds, to raise livestock for meat, diary, hide and wool products. It comprises all grasslands used to provide feed for animals, including cultivated pastures as well as wild grasslands and prairies.
FOREST
represents the area of forests required to support the annual harvest of fuel wood, pulp and timber products.
FISHING GROUNDS
represent the area of marine and inland waters necessary to generate the annual primary production required to support catches of aquatic species (fish and seafood) and from aquaculture.
CROPLAND
consists of the area required to grow all crop products required for human consumption (food and fibre), as well as to grow livestock feeds, fish meals, oil crops, and rubber.
BUILT-UP LAND
represents the area of land covered by human infrastructure such as transportation, housing, industrial structures and reservoirs for hydroelectric power generation.

What is the unit?

- The common unit of ecological footprint and biocapacity is the global hectare (gha)
- This unit represents an “average” hectare of global land in terms of biological productivity
- The unit is normalized by:
  - Land type (compare between land types gha)
  - Time (compare between years)

Measurement Unit: Global hectare (gha)

For example, if this hectare is **twice** as productive as a world average, biologically productive hectare. Then it is worth 2 gha.

→

2 gha

For example, if this hectare is **half** as productive as a world average, biologically productive hectare. Then it is worth ½ a gha.

→

½ gha

The National Footprint Accounts Dataset

Accounts of Ecological Footprint and biocapacity

- 242 countries, territories and the world.
- All years from 1961 to 2014
- Produced annually (Summer through Winter)
- Updated and improved through an ongoing process of research, and approval by an expert committee, and scientific peer review

Ecological Footprint takes the Consumption approach

Imports

EF_I

EF_P

Production Activities:
-Agriculture
- Silviculture
- Farming
- Fishing
-Manufacturing
-Oil Production
-etc

EF_E

Exports

$$EF_C = EF_P + (EF_I - EF_E)$$

BIOCAPACITY

Consumption Perspective

$$EF_C = EF_P + \left(EF_I - EF_E \right)$$

Ecological Footprint of Consumption

Ecological Footprint of Production

Net Ecological Footprint of Trade

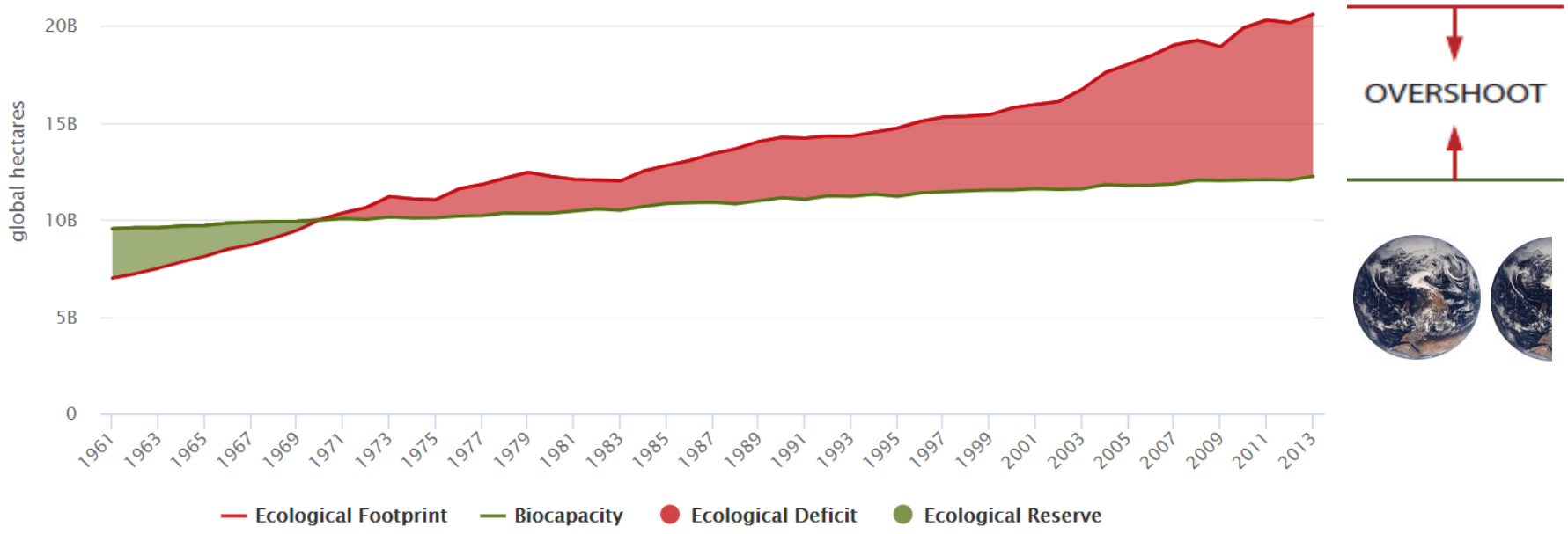
$$EF = \frac{P}{Y} \cdot Y \cdot EC$$

Use world footprint intensities

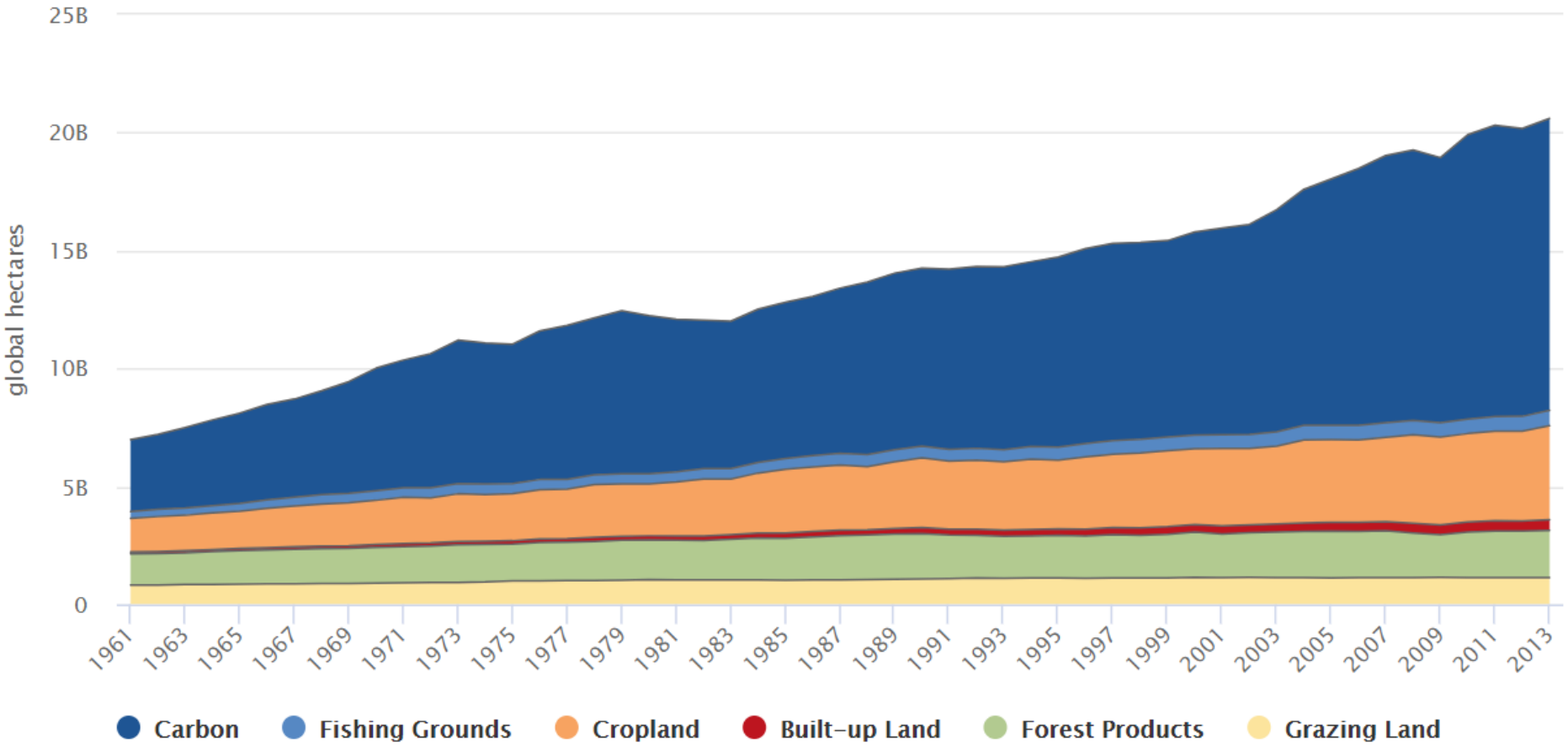
Use production + import footprint intensity

Humanity's Ecological Footprint and biocapacity

World Ecological Footprint



Humanity's Ecological Footprint and biocapacity



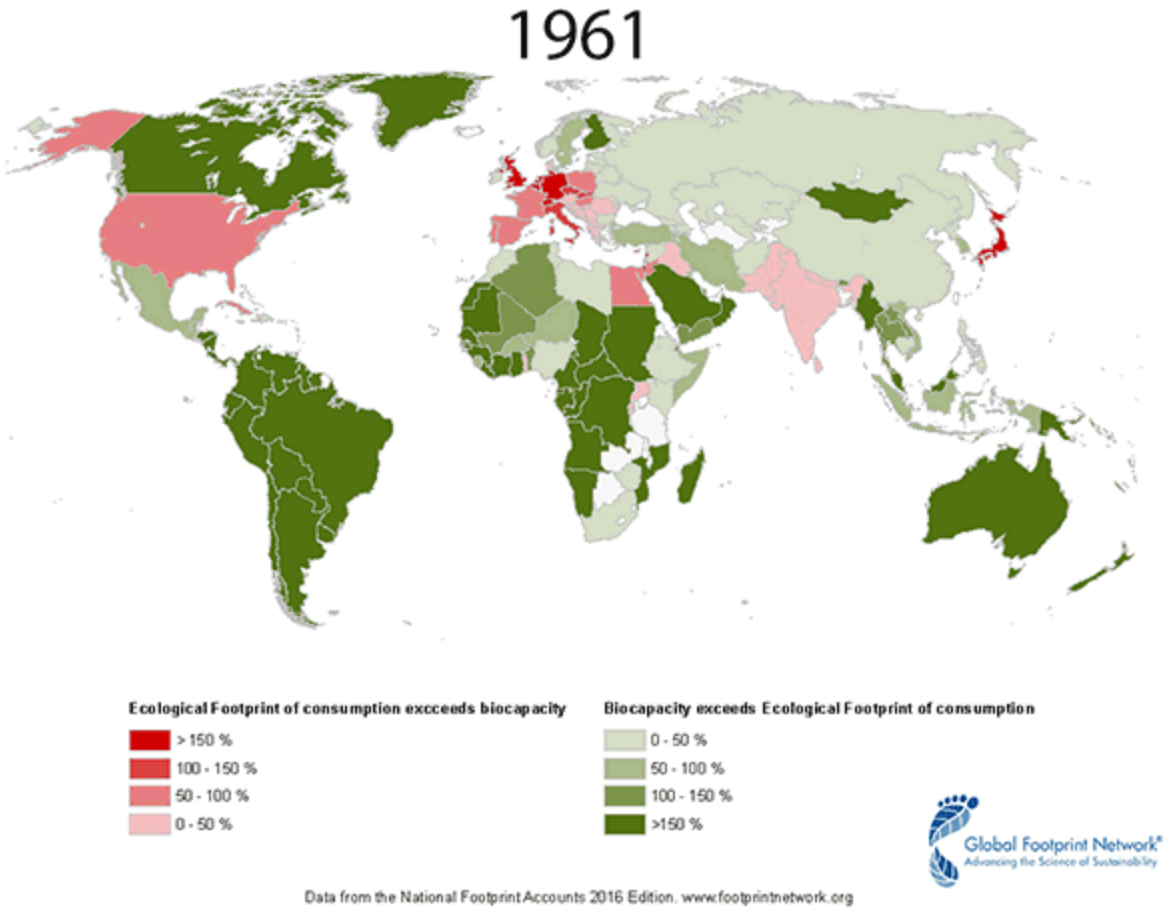
Implications of Ecological Overshoot


Ecological Overshoot is physically manifested as a combination of the following 2 possibilities

1. Reduction/degradation of natural capital stocks
2. Accumulation of waste

*This is different than National Deficit

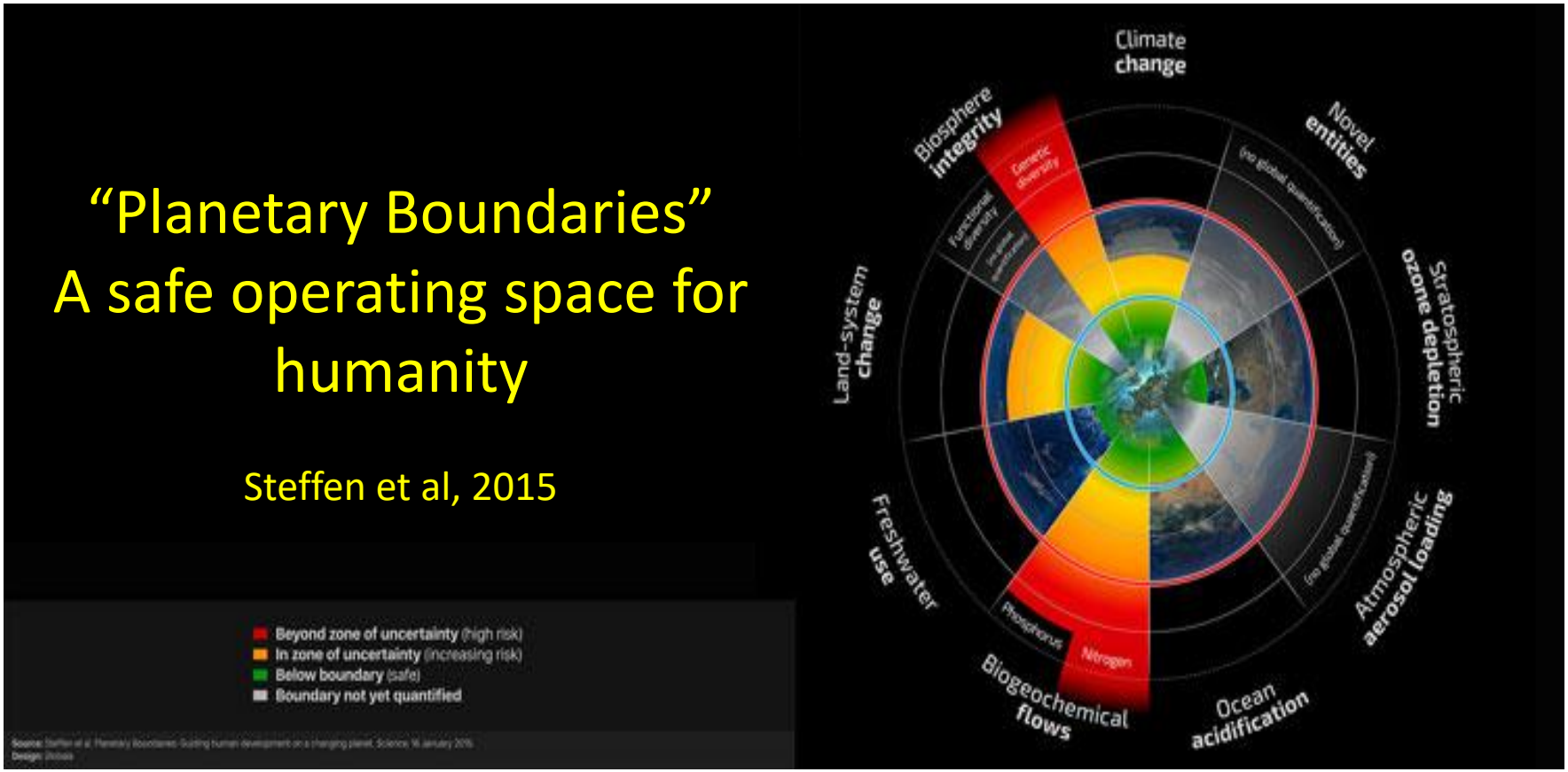
Ecological Wealth of Nations



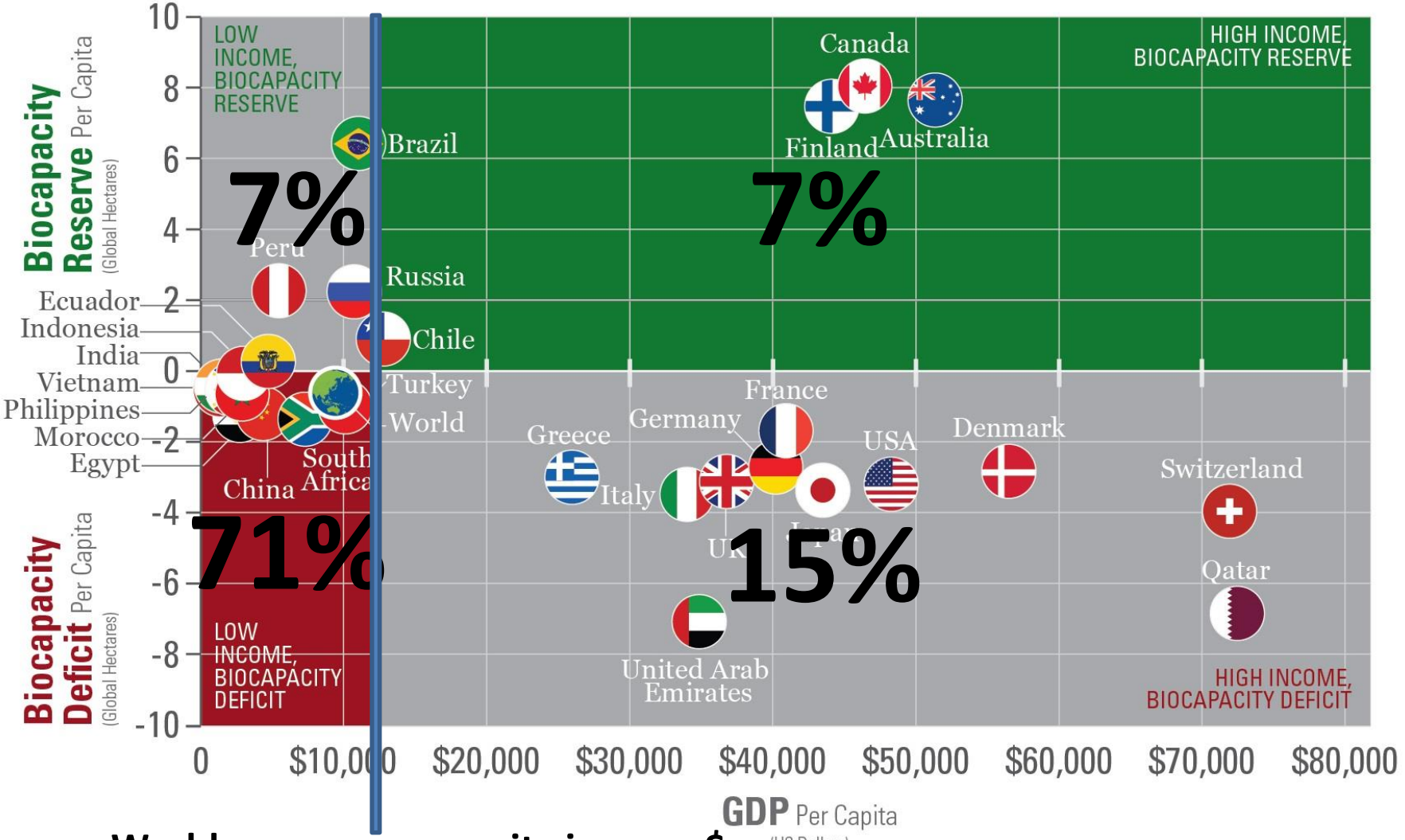
Resource and sustainability challenges

"Planetary Boundaries"
A safe operating space for humanity

Steffen et al, 2015

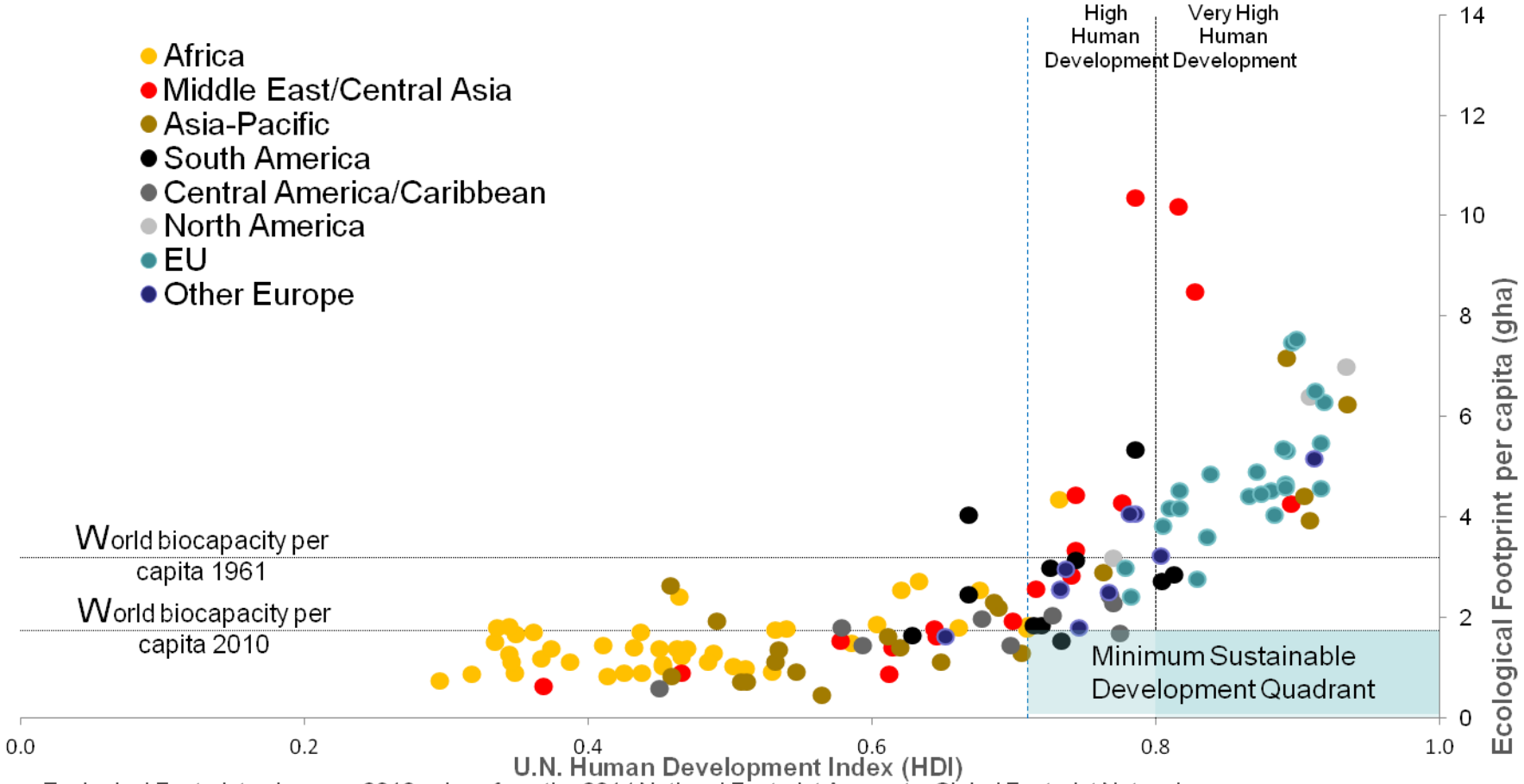


Biocapacity and GDP describe resource distributions



World-average per capita income $

The Challenge of Sustainable Development



Ecological Footprint values are 2010 values from the 2014 National Footprint Accounts, Global Footprint Network.
HDI 2010 values are from the 2013 Human Development Report, UNDP

Key Questions and Messages


- **Why is sustainability important?**
- **What is the context of sustainability?**
  - **Is Biocapacity is a key limiting factor?**
- **You cannot manage what you do not measure.**
- **The Ecological Footprint Concept can be calculated for Countries as accounts (NFA).**
- **EF is consumption based (includes production)**

Thank you!

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