



The Ecological Footprint: A Tool for Navigating Tough Choices in a World of Ecological Constraints

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Global Footprint Network
Advancing the Science of Sustainability



Program

What is Biocapacity: *how much do we have?*
and *how much do we use?*

How does Biocapacity accounting work?
Limitations

Applications (Egypt, Optimum Resource
Consumption)

Why does it matter?

Footprint Questions

- ***Footprint:*** How much of the regenerative capacity of the biosphere is used by human activities?
- ***Biocapacity:*** How much is available within a region?



Why Biocapacity?

Why not non-renewables (ores, fossil fuel)?

What about water?

What about EROI?

Why not NPP (Net Primary Production) ?



“Theoretical Basis”

$$\text{Footprint Area} = \frac{\text{Amount per year}}{\text{Yield}}$$

Amount consumed ($C=P+I-E$) plus
corresponding waste and seeds

Yield (adjusted for land type and
productivity)



Global Hectare

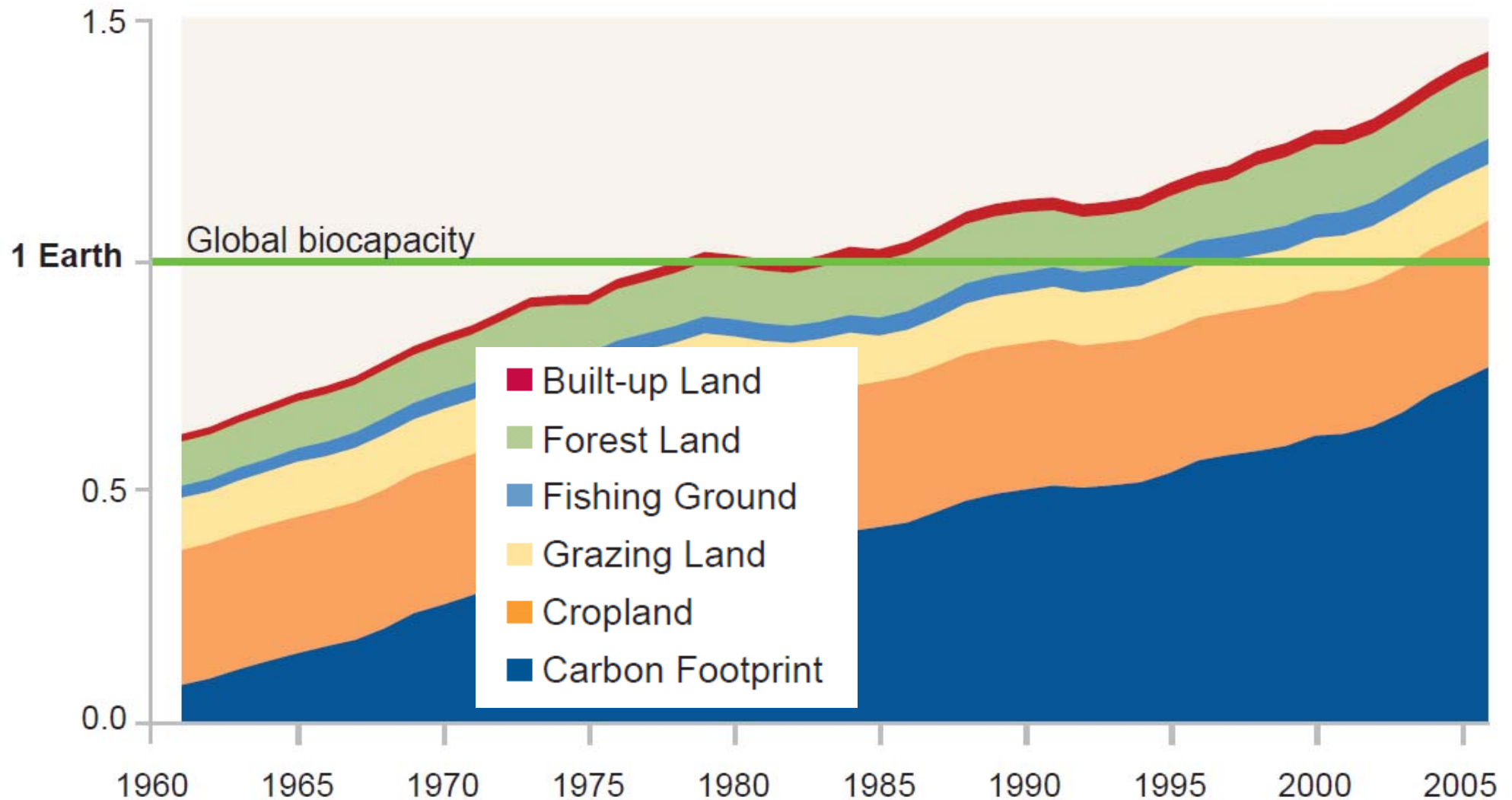
Yield factor

Equivalence factor

Technology...



Humanity's Ecological Footprint (1961 onwards)



Footprint Limitations



What are the relevant questions?

Airplane dashboard

What do you need to know?

How can you best answer?

What's excluded?

- Non-environmental aspects of sustainability
- The size of the deficit tends to be too small
- Reduction of non-renewable resource stocks
- Inherently unsustainable activities
- Environmental damage
- Loss of biological diversity

What's improvable?

- Damage done to the environment by waste and pollutants
- Freshwater consumption is expressed indirectly
- Method is based on some global averages (trade)
- Tourism

The Scientific Process (I)

- TRANSPARENCY
- Method papers
- Scientific papers
- Standards
- Webpage
- Academic license (free)
- Project/research license (low-costs or free; for quality and against fragmentation)
- Handbook (since 2008)

The Scientific Process (II)

- FORA FOR IMPROVEMENT
- Two committees
- Research in support of committees
- Consensus process on committees
- Public and stakeholder input
- Structured country research collaborations (7 + countries)



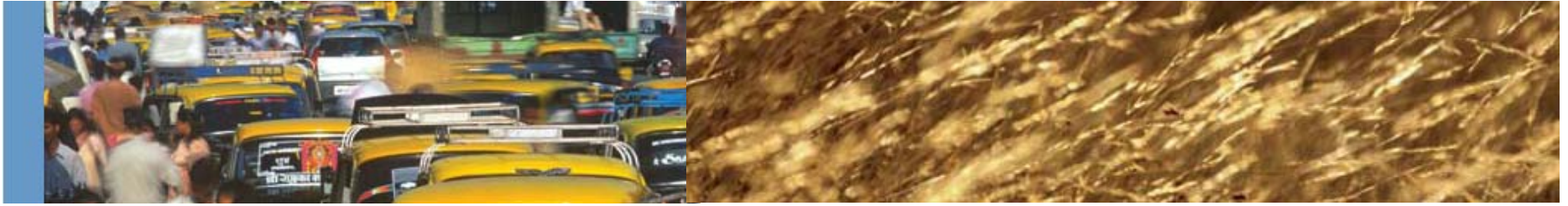
Egypt Exercise



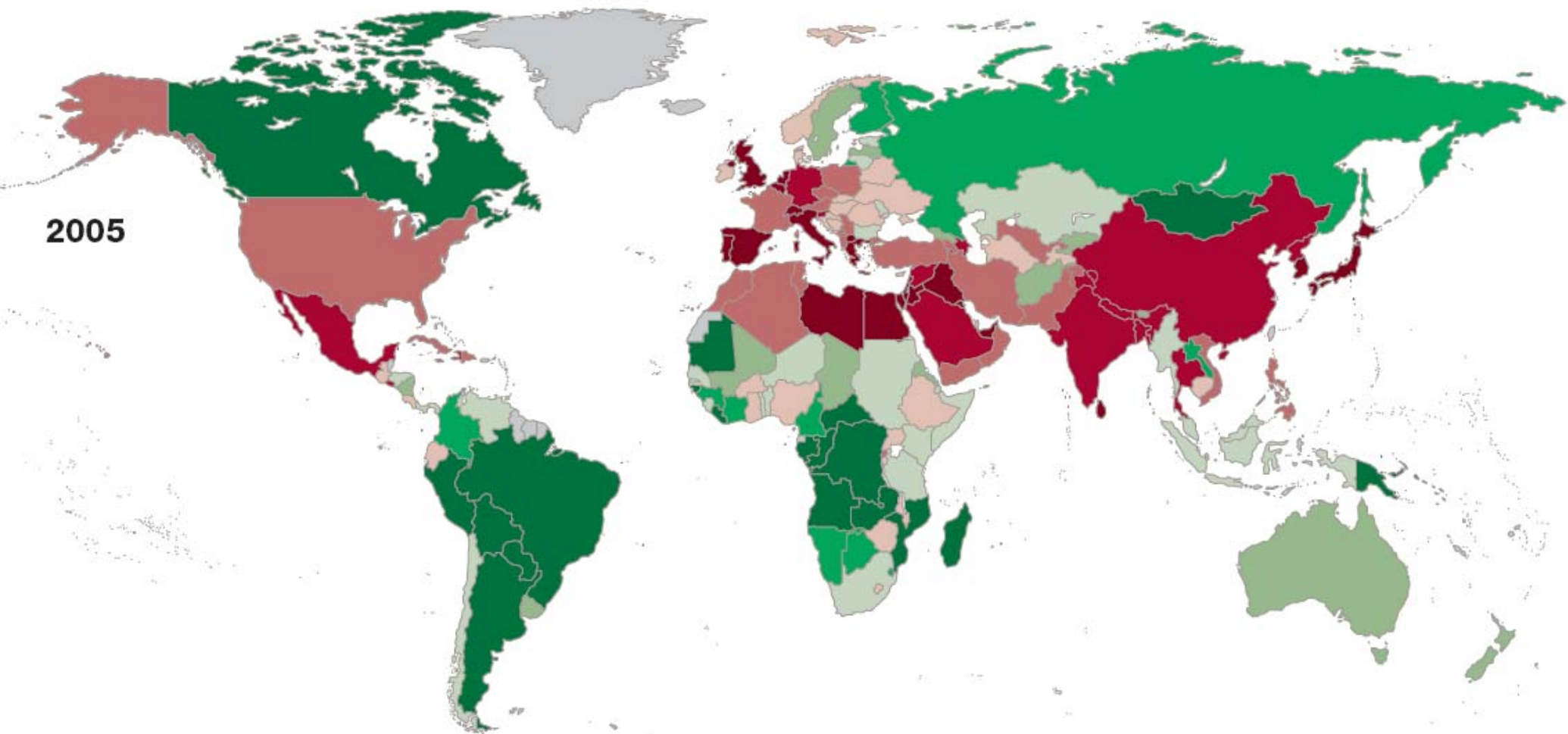
Tragedy of the Commons (*shrink & share*)

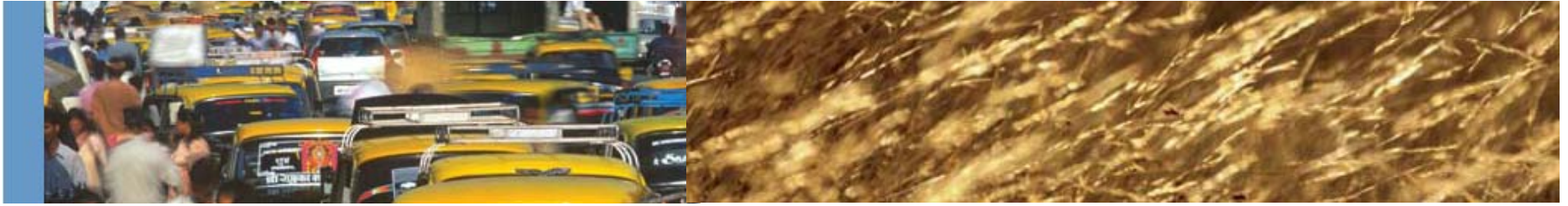
⇒ **The Comedy of Common Sense**



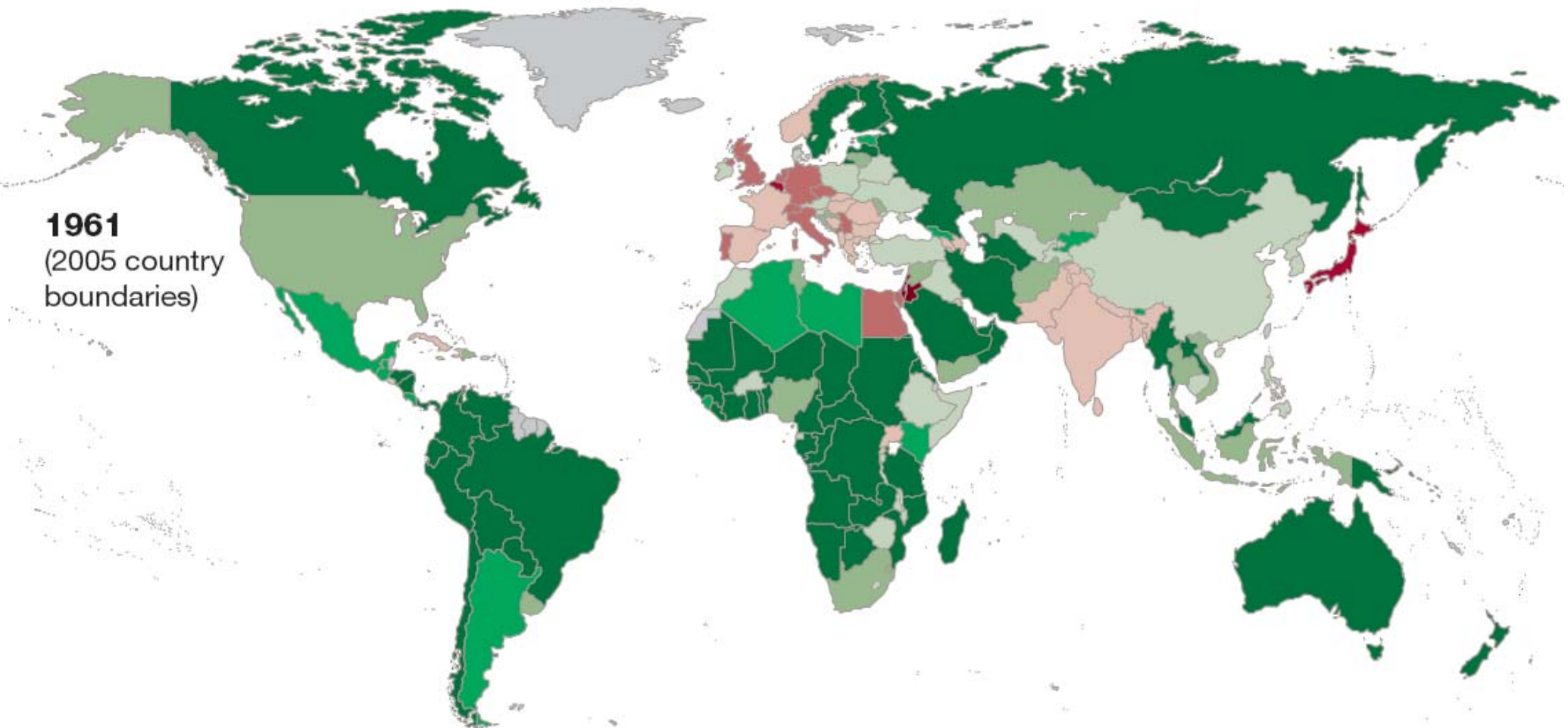


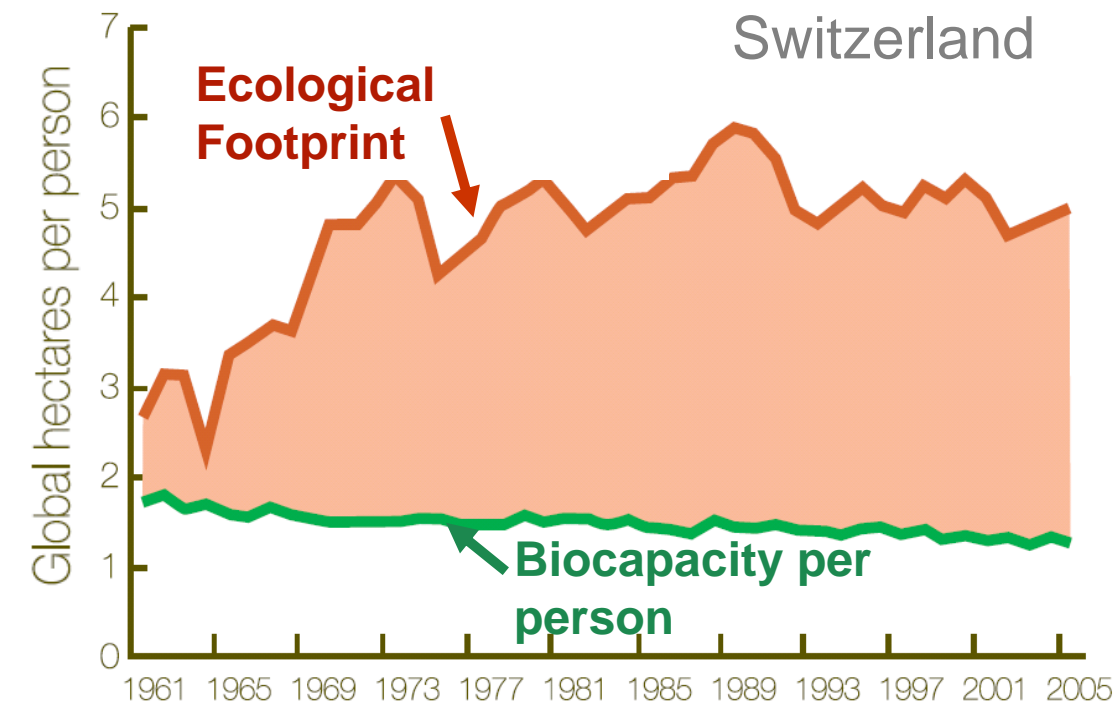
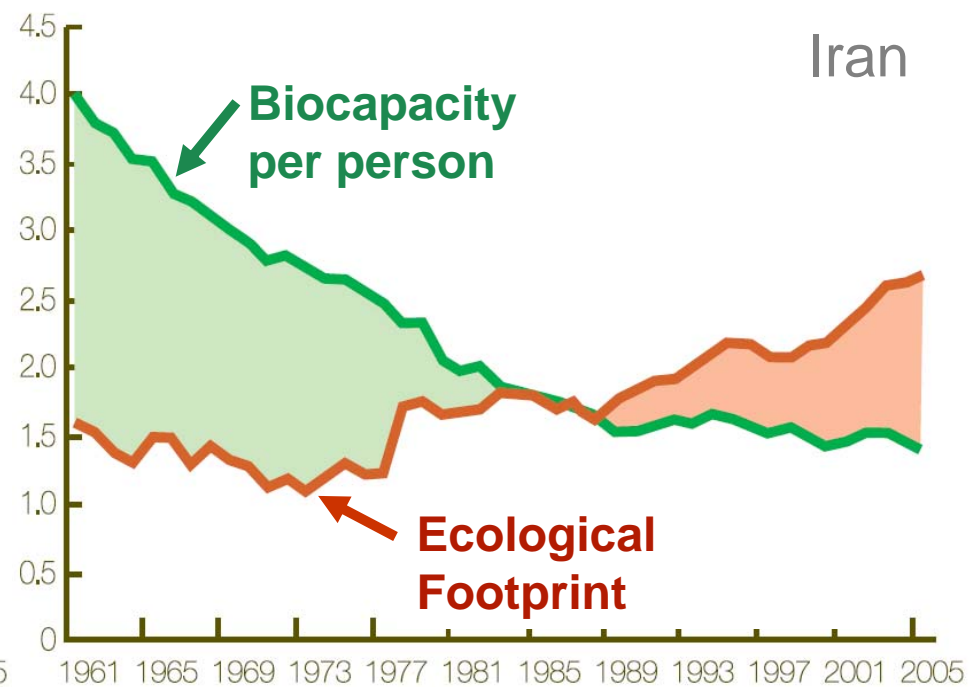
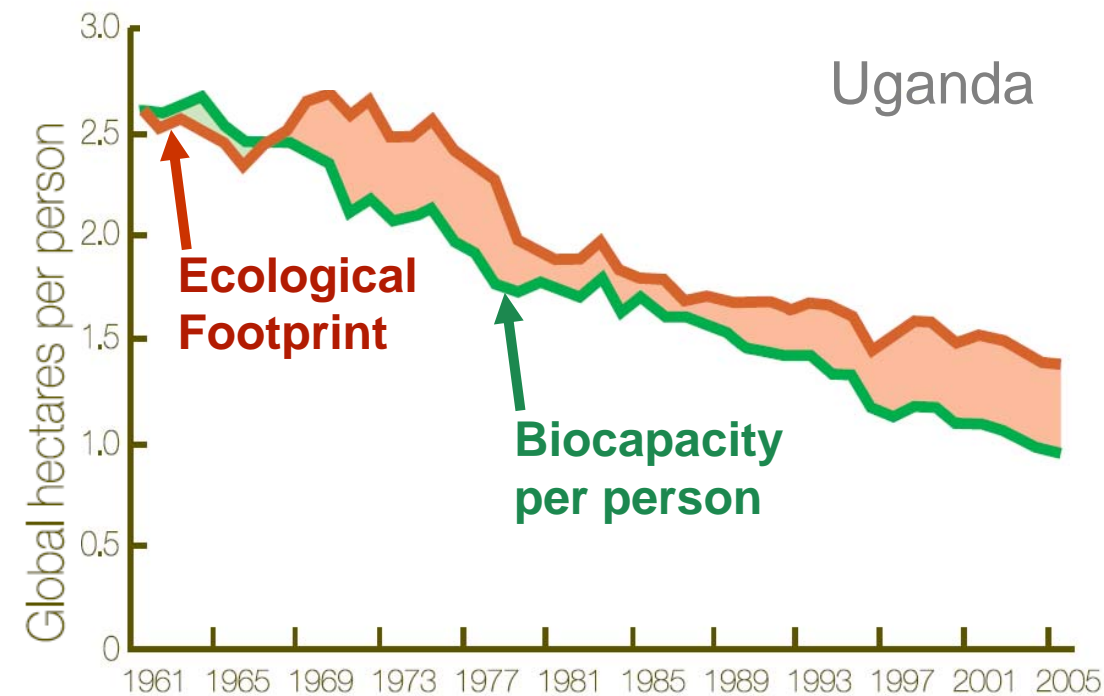
Ecological Creditors and Ecological Debtors





Ecological Creditors and Ecological Debtors





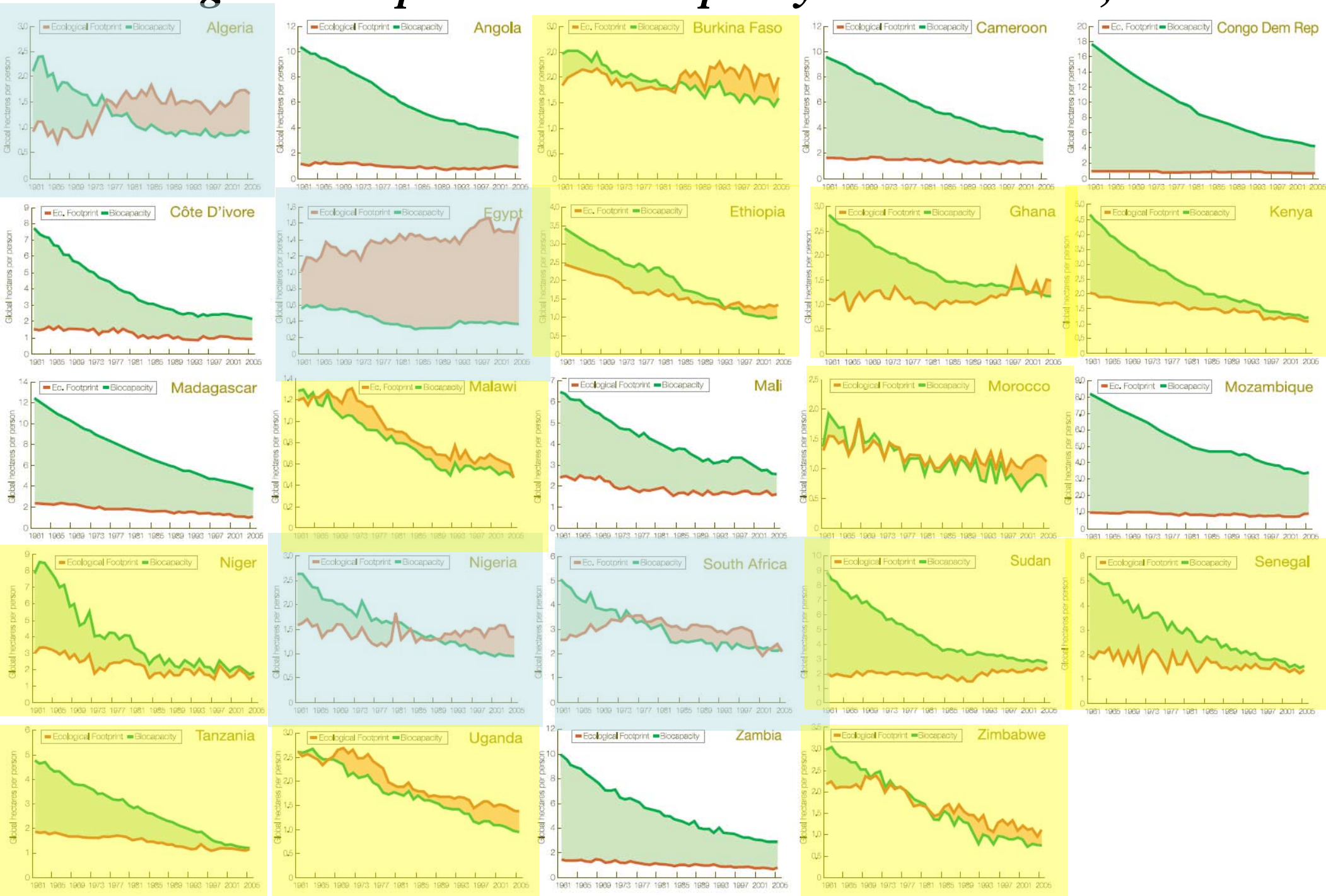
The **Ecological Footprint** and **biocapacity** (per capita) of three countries from 1961-2005. A country runs

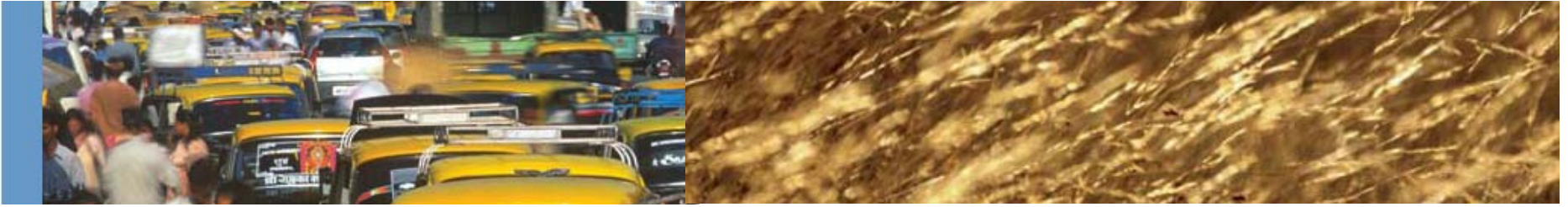
an **ecological deficit**

if its **Footprint** exceeds **what its ecosystems can renew**. The deficit is made up through net-imports, net-carbon emissions to the global atmosphere, or local resource degradation.

Ecological Creditors and Ecological Debtors in Africa

Ecological Footprint and Biocapacity PER CAPITA, 1961-2005



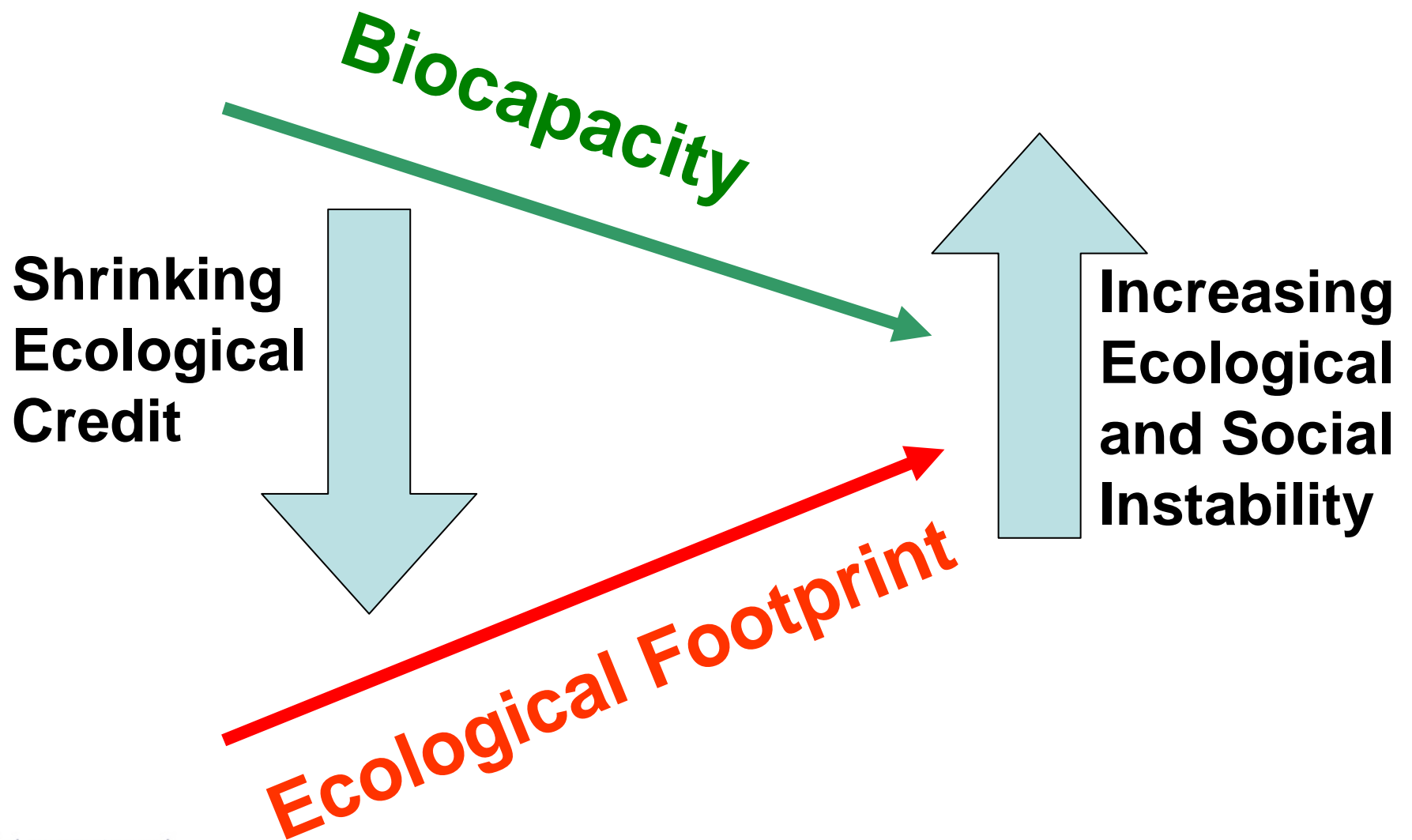
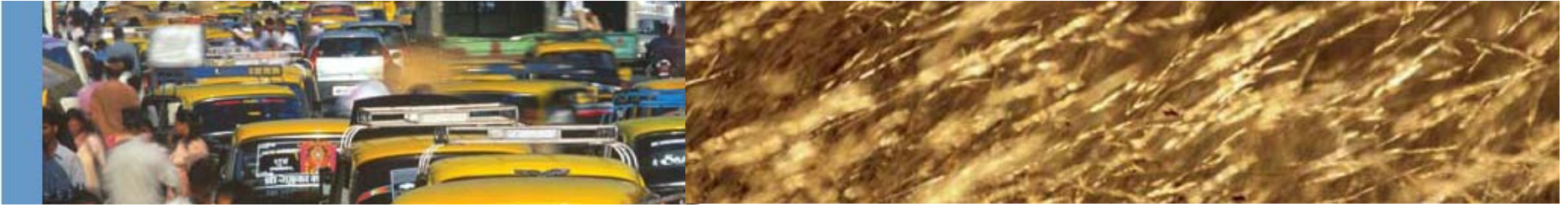


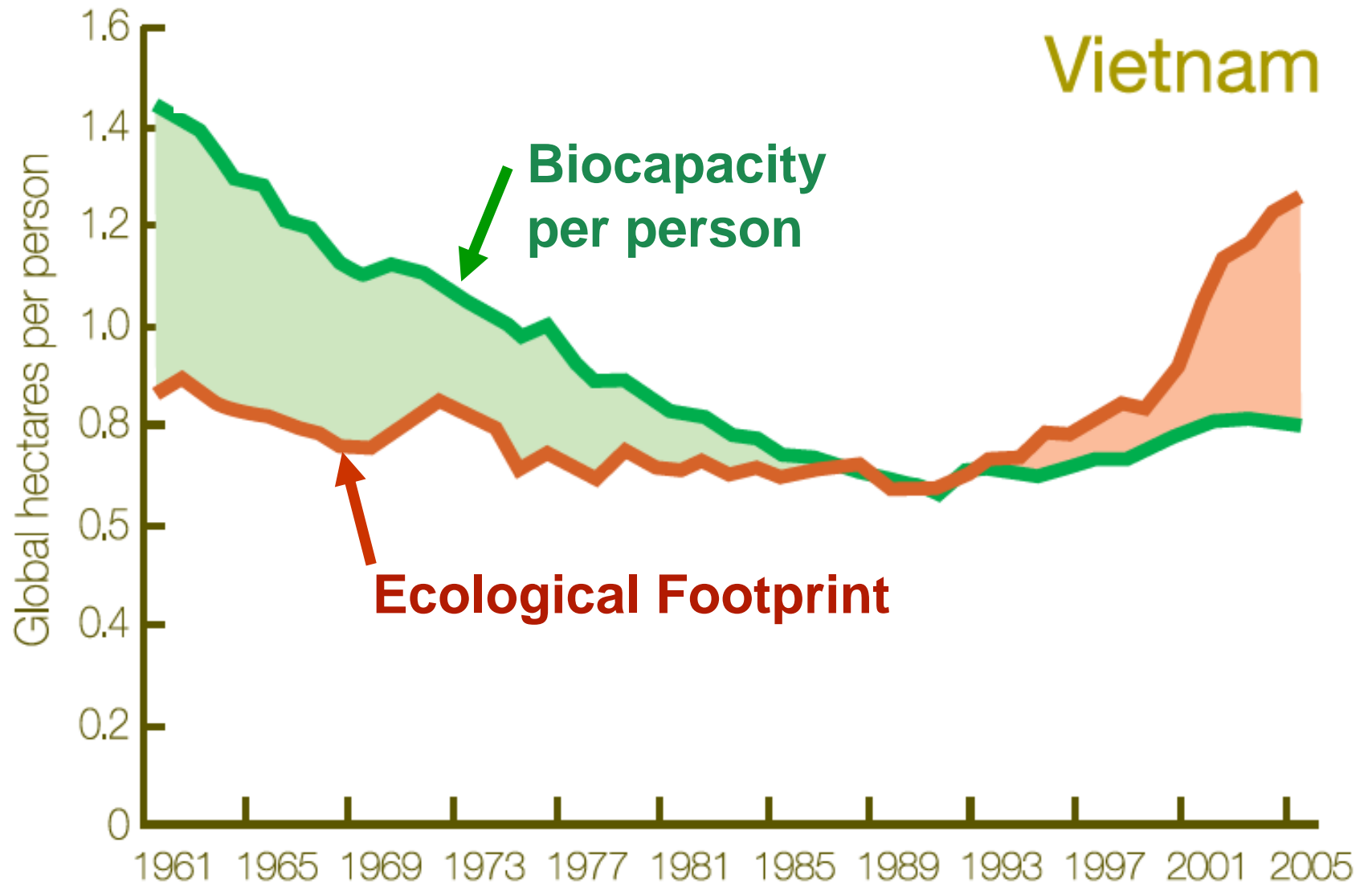
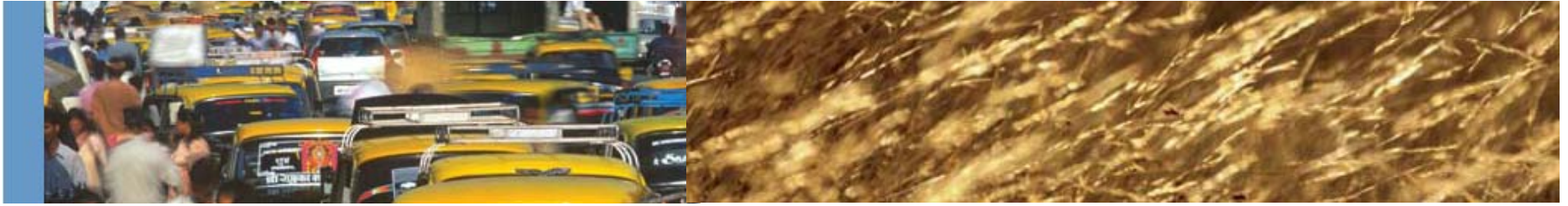
What do these graphs show?

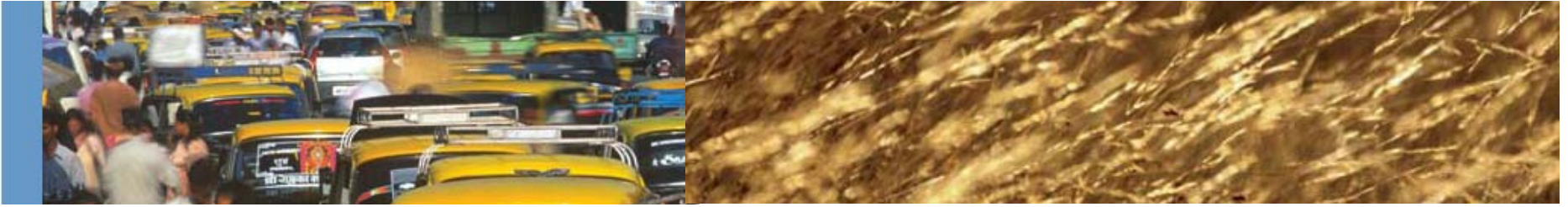
All 24 African countries are rapidly losing per-capita biocapacity.

Four (**blue-shaded**) countries have assets that allow them to have a net-import and to burn significant quantities of fossil fuel.

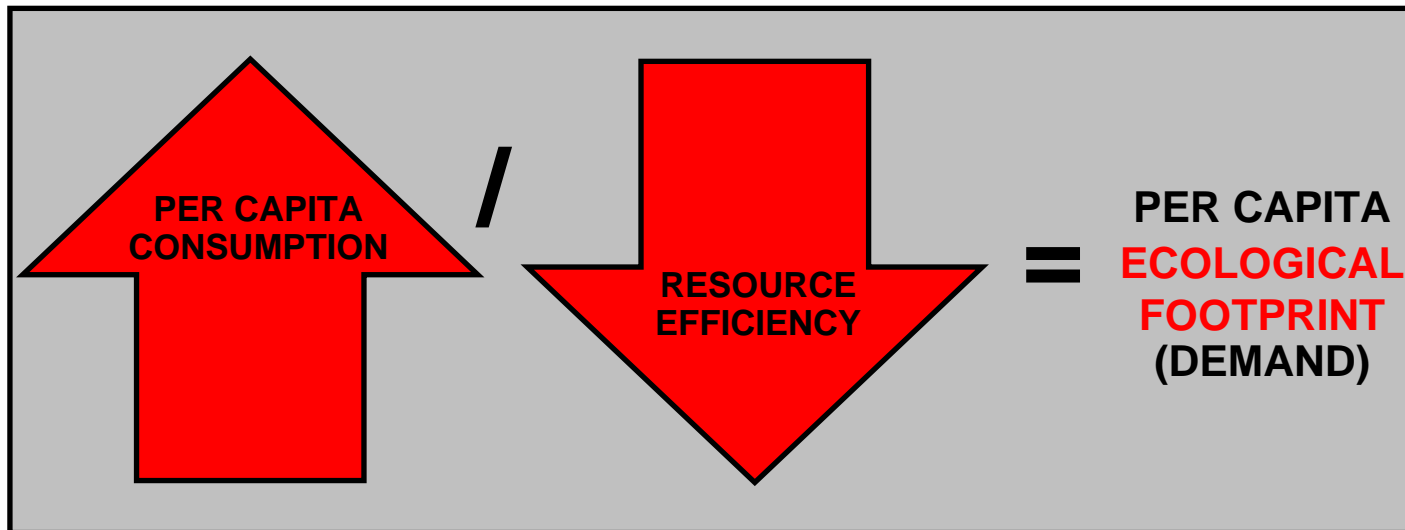
Twelve (**yellow-shaded**) countries' development is limited by their declining biocapacity, leading to SEVERE conflicts.





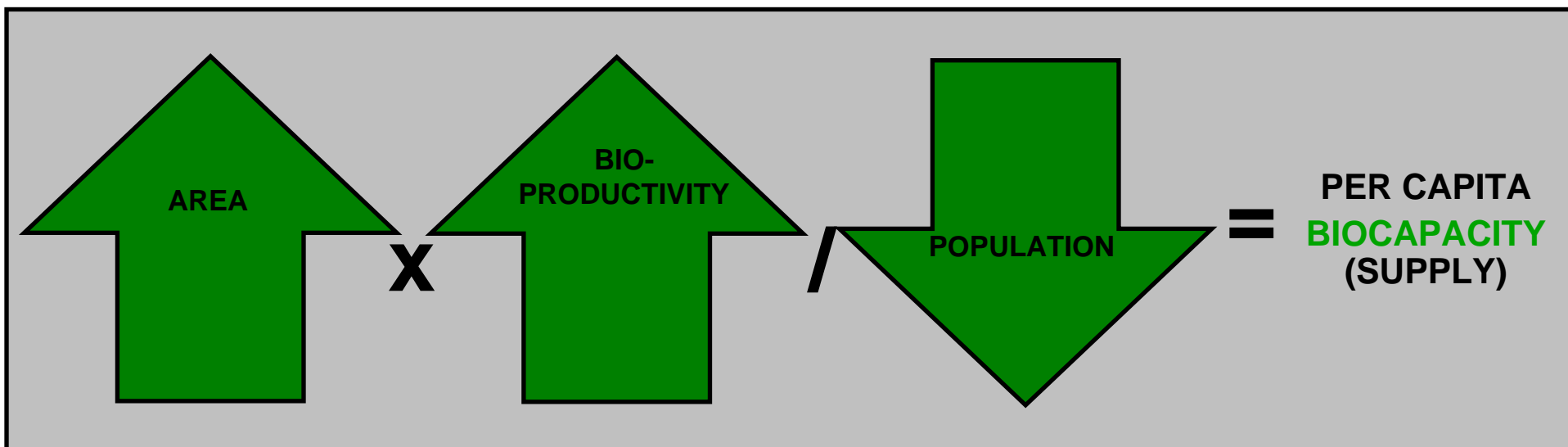


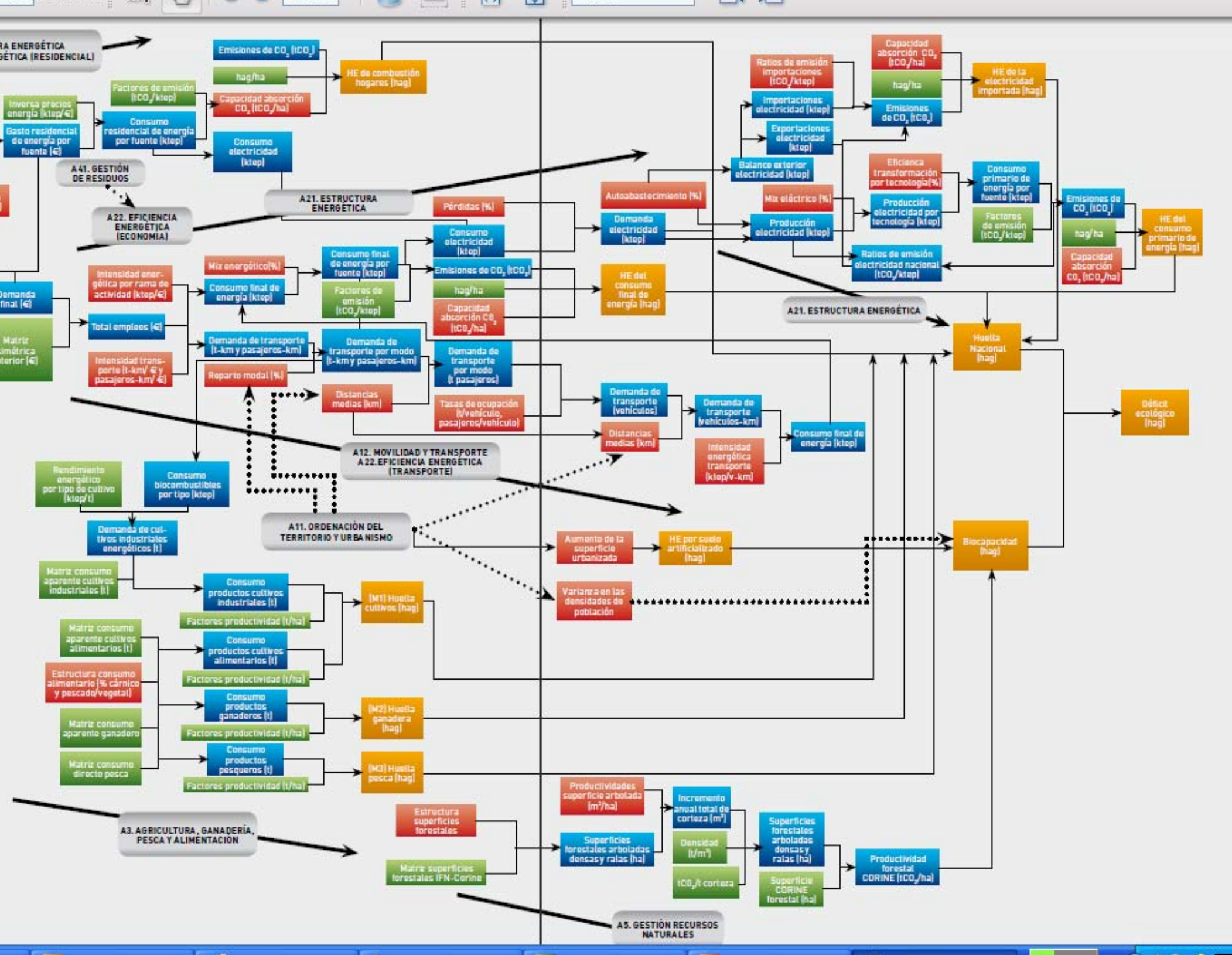
Optimal Resource Consumption



Five Factors

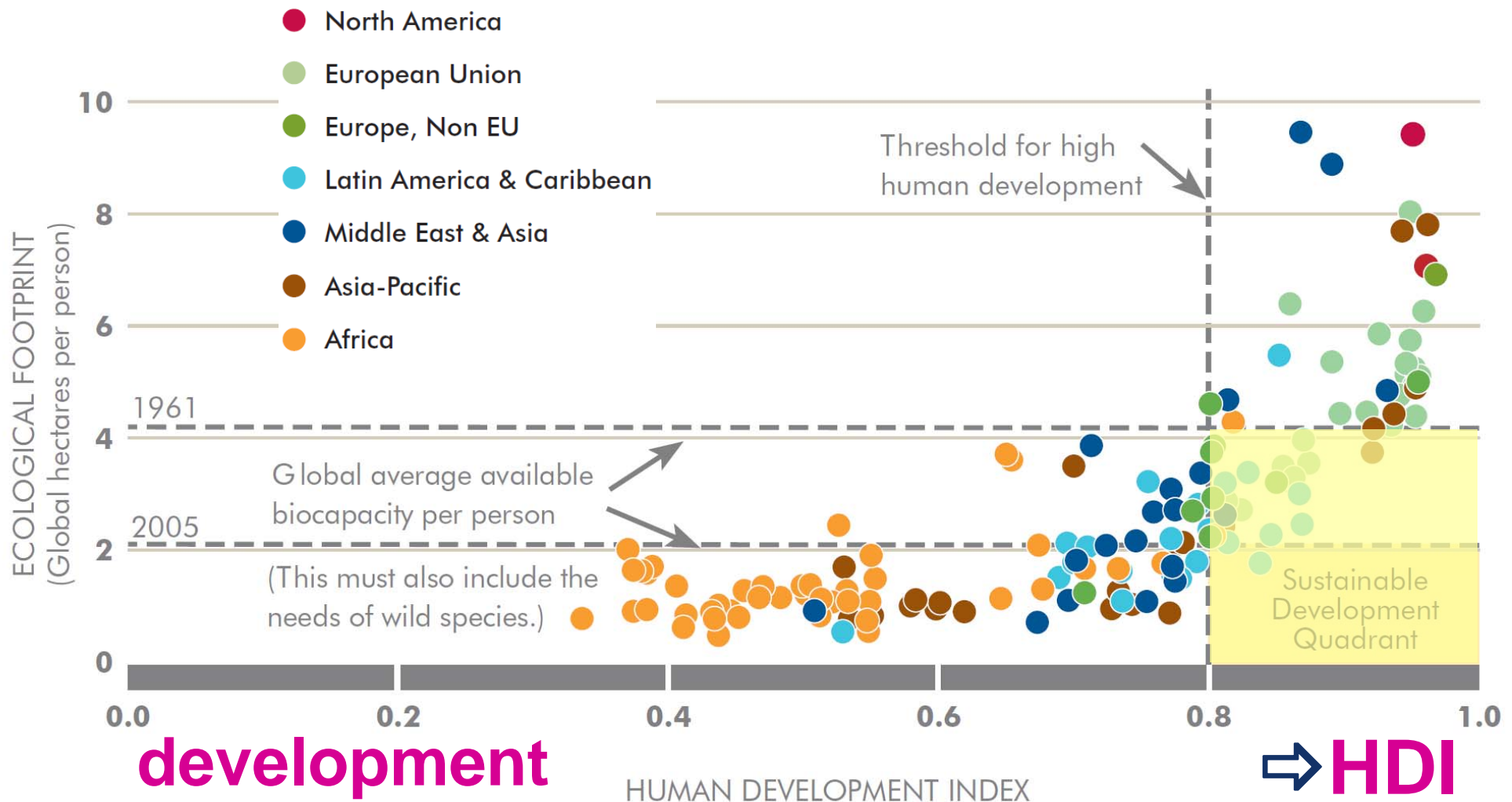
←→
DIFFERENCE
BETWEEN
BIOLOGICAL DEMAND
AND **SUPPLY**







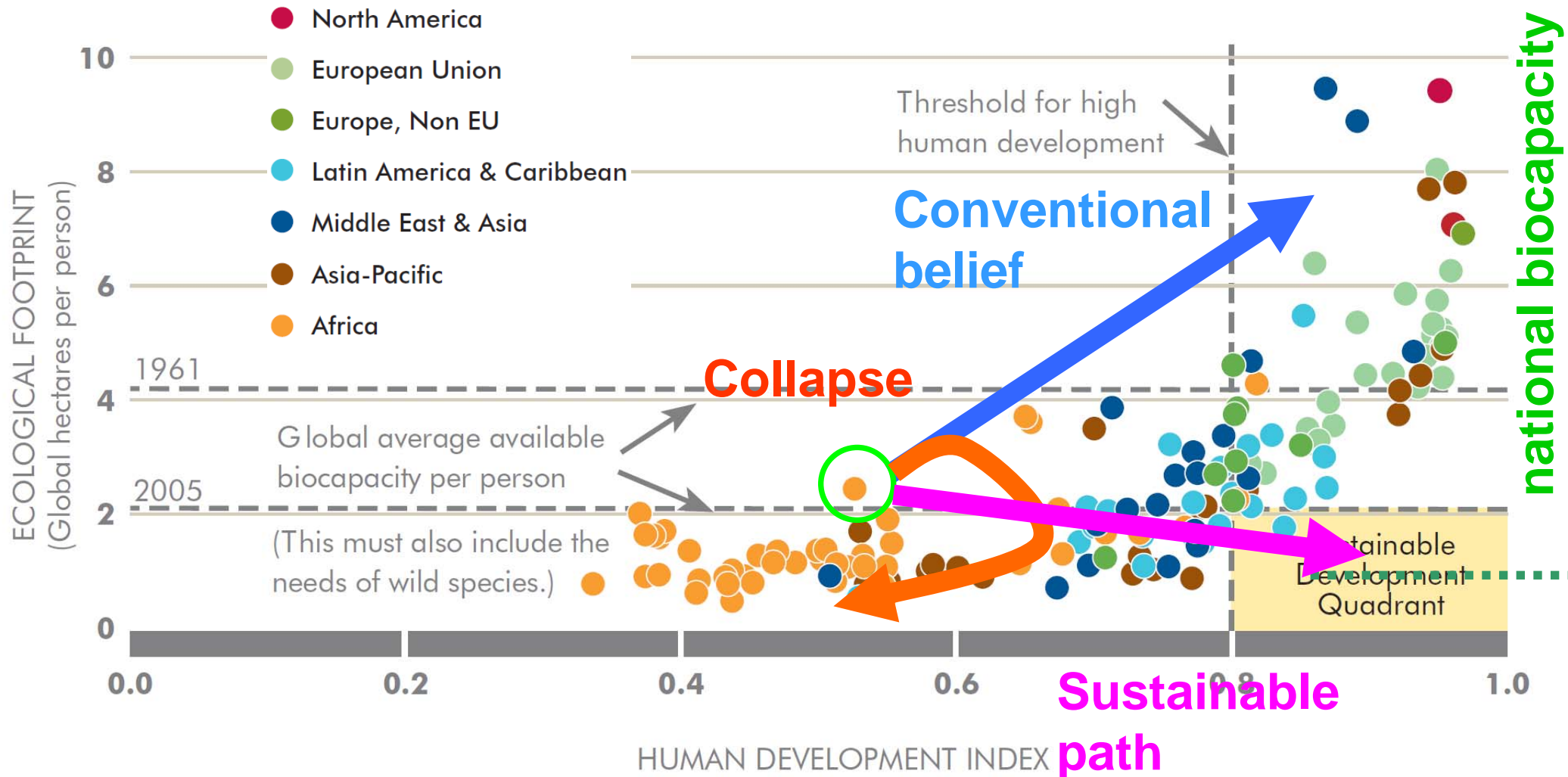
Measuring “sustainable development”



↑ Sustainable (fits on one planet?)



How close are we today to attaining global sustainability?



Calculating a sub-national, population-based Ecological Footprint

Summary of
Application Standard for
calculations at sub-national level



Global Footprint Network
Advancing the Science of Sustainability

Step 1: Basic Principles: The Underlying Science of Footprinting



Step 2: MACRO: The National Footprint Accounts. Establishing the “global currency” and basic conversion factors.



Step 3: From MACRO to MICRO: Applications and techniques building on the National Footprint Accounts

Footprint Questions

- ***Footprint:*** How much of the regenerative capacity of the biosphere is used by human activities?
- ***Biocapacity:*** How much is available within a region?

What is a Human Activity?

- **Consumption:** Maintaining a population's consumption (any population: an individual, city, region, state, humanity, by income, gender etc.)
- **Production:** Supplying ecological capacity for enabling an economy's value-added process
- **Product:** Providing a product or service
- **Process:** Maintaining an activity of an organization

Steps for Sub-national Population-based Footprint Application

- 1 • National Footprint Accounts
- 2 • National Consumption-Land-use Matrix or Production – Land-use Matrix
- 3 • Comparative consumption / production patterns between national average and sub-national average
- 4 • Establishment of sub-national Consumption-Land-use Matrix or Production – Land-use Matrix
- 5 • Details enhanced with LCA analysis (calibrated against *National Footprint Accounts*) and local biocapacity studies

Consumption - Land-use Matrix

In global hectars per person	Energy land	Crop Land	Pasture Land	Forest	Built-up Land	Fisheries	Total
Food							
Shelter							
Mobility							
Goods							
Services							
Total	2.3	0.8	0.6	1.1	0.2	0.3	5.3



National Footprint Accounts

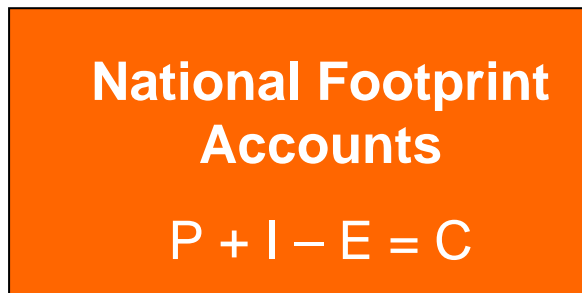
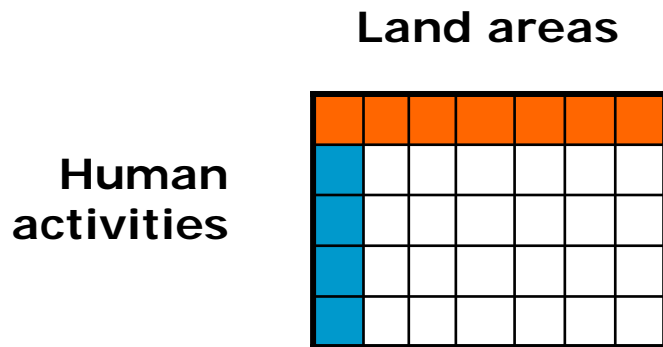
**National Footprint
Accounts**

$$P + I - E = C$$

2

Consumption - Land-use Matrix

National Consumption - Land-use Matrix



3

Comparative consumption patterns between national average and sub-national average

**National Consumption -
Land-use Matrix**

Land areas

Human
activities

Sub-population

(region, social,
individual)

**Sub-National Consumption -
Land-use Matrix**

Human
activities

**National Footprint
Accounts**

$$P + I - E = C$$

4

Establishment of sub-national Consumption-Land-use Matrix

National Consumption -
Land-use Matrix

Sub-National Consumption
- Land-use Matrix

