

**FACULTY OF NATURAL SCIENCES**

# ECOLOGICAL FOOTPRINT & SUSTAINABLE DEVELOPMENT

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# INTRODUCTION

- The concepts of sustainable development and ecological footprint are firmly embedded in the principle of sustainability.
- Looked at this when considering sustainable harvesting – removal of resources at a rate lower than the replacement rate, to prevent reduction in capacity of the resource.

# DEVELOPMENT VS FOOTPRINT

- **Sustainable development** – *“economic development that satisfies current and future needs for resources and employment while minimizing the impact on biological diversity”* (Lubchenco *et al.*).
- **Ecological footprint** – the area needed to regenerate or provide resources equivalent to consumption for a given entity.
- Not a simple concept to manage
  - Establishment of levels of extraction for sustainability is hard.
  - Conflict between ecocentrism and anthropocentrism.

# SUSTAINABLE DEVELOPMENT

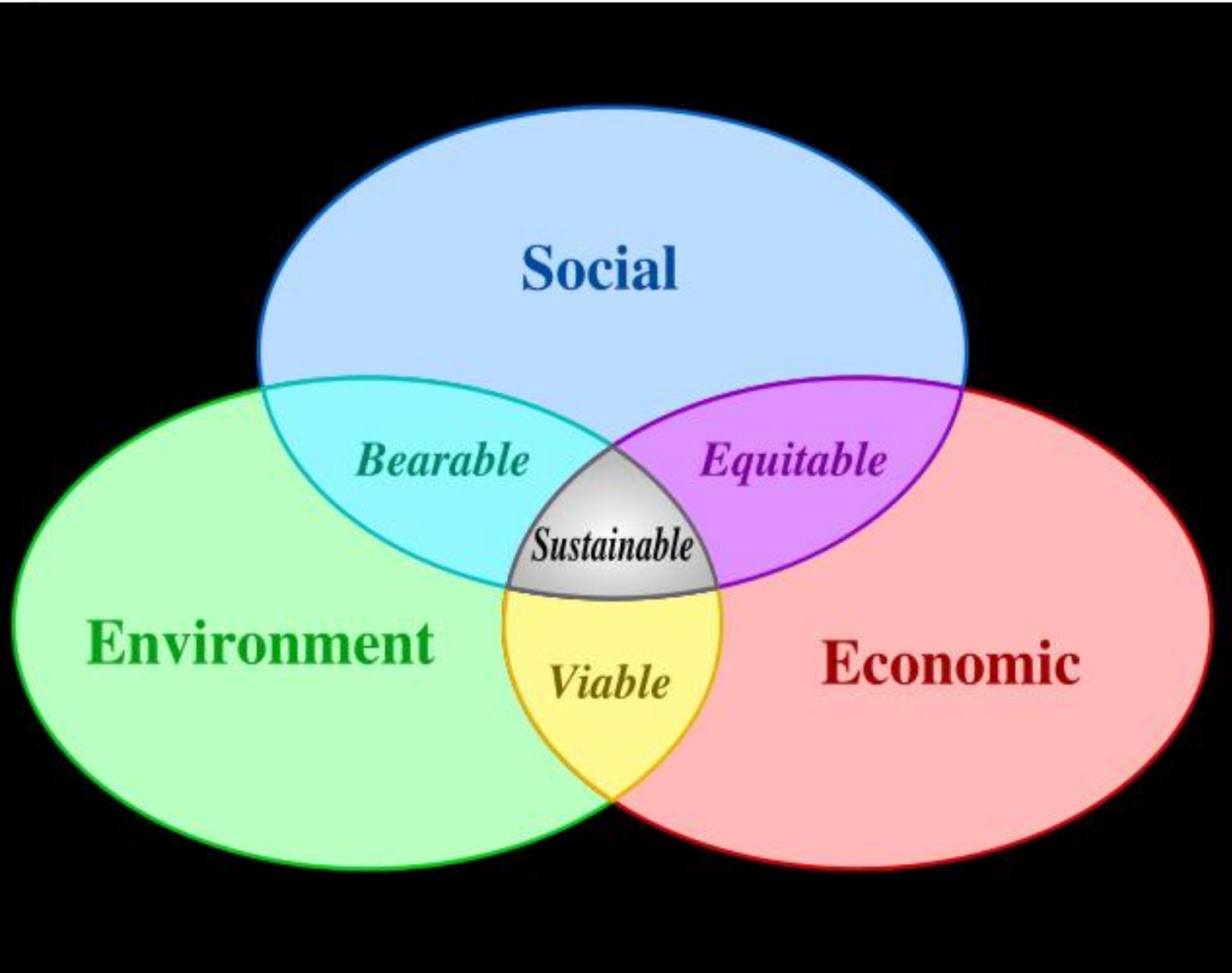
- This is a concept that arose out of the IUCN's 1980 World Conservation Strategy.
- Global population growth creates a vast reservoir of humanity with certain resource requirements.
- Poverty is a major factor in exploitation of natural resources in a basic and unmanaged way.
- The disparity in quality of life and resource use clearly makes a strong case for upliftment of the poor.
- In principle, SD allows for economic growth within the margins of environmental capacity.

# SUSTAINABLE DEVELOPMENT

Three possible levels of consumption:

- Consumption  $>$  planet's ability to regenerate (environmental degradation). Ultimately will lead to human extinction.
- Consumption = planet's ability to regenerate (environmental equilibrium). Maintains systems at the *status quo*.
- Consumption  $<$  nature's ability to regenerate (environmental renewal). Allows for sustainable development (i.e. changing infrastructure to cope with new demands).

# THE INTERSECTION OF DIFFERENT POLITICAL AND SCIENTIFIC AREAS



# SCOPE OF SUSTAINABILITY

Clearly many things fall directly under the scope of sustainable development

- International trade
- Energy development
- Agricultural practices
- Education
- Health care
- Conservation priorities

# WORLD SUMMIT ON SUSTAINABILITY

- Johannesburg Declaration (2002) from the Earth Summit committed first and third world nations to Addressing “*the worldwide conditions that pose severe threats to the sustainable development of our people*”.
- It also mentioned a large number of these threats: “*chronic hunger; malnutrition; foreign occupation; armed conflict; illicit drug problems; organized crime; corruption; natural disasters; illicit arms trafficking; trafficking in persons; terrorism; intolerance and incitement to racial, ethnic, religious and other hatreds; xenophobia; and endemic, communicable and chronic diseases*”.
- Unfortunately, non-specific regarding actions and commitments from signatory nations.

# POTENTIAL FOR S.D.

- Strong negotiating stance for the third world to leverage development aid (eg: NEPAD)
- Smart developing nations can focus on long-term viability (problem with the length of political terms).
  - Alternative energy sources might be longer lasting.
  - Internal development focusing on renewables can lead to market share (India).
- Development of alternative national economic strategies not feasible do to global nature of capital.

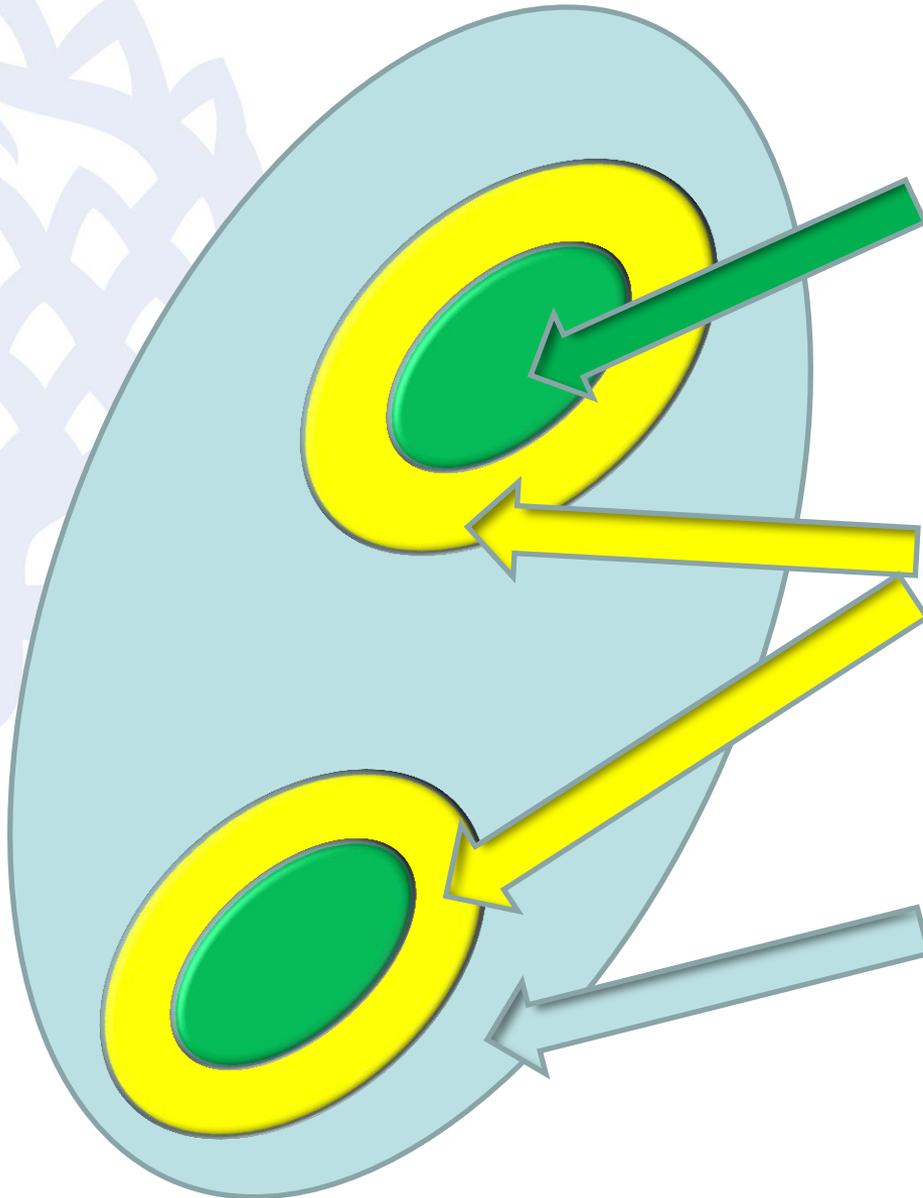
# POTENTIAL FOR S.D.

- However, localised solutions may be better for communities and ecology within the area
- Untapped potential of growing populations in terms of manpower can be utilised whilst reducing impacts on the environment.
- Provides a framework for responsible investment by the developing world, and guidelines for developed world to achieve goals without running the risk of messy overdevelopment of areas.
- By including grassroots upliftment as a focus, it avoids the failed “trickle down” paradigm.

# IS IT EVEN FEASIBLE?

- Investment policies and loans need to take into account the concept of sustainable development and to integrate it into their conditions
- Biosphere reserves typify the areas developed under the sustainable development paradigm:
  - Central conservation areas for biodiversity protection
  - Limited use buffer zone with some development and usage rights for local populations
  - Outer area with regulated development and focus activities that are less damaging to the local environment
  - Currently 440 biosphere reserves internationally, protecting 220 million ha

# BIOSPHERE RESERVE DESIGN



Central conservation areas (State owned)

Limited use buffer zone with some development and usage rights for local populations

Outer area with regulated development and focus activities less damaging to the local environment

# IS IT EVEN FEASIBLE?

- One criticism that is often levelled at the concept of sustainable development is that it is contradictory.
- Requires use of resources that may be irreplaceable.
- Current concepts of growth are based on economics that do not integrate true resource values; therefore are definitively unsustainable.

# CRITICISMS 1

Main focus is on the third world, but there is a clear division of focus within the issue:

- Developing nations focus on *development*, and hope to achieve American-style economies.
- Developed nations focus on *sustainable*, which means reduced consumption of resources by developing nations.

# CRITICISMS 2

- Challenged as an extension of Western imperialism, since the developed nations are not prepared to invest in alternative routes of development for the third world.
- Without free technologies and considerable funding and support, developing nations have no choice but to follow the only paradigm that is proven to be effective – western industrialization.
- “Greenwashing” by corporations, which use sustainable development (and “fair trade”) as a marketing tool without making serious changes to policy.

# CRITICISMS 3

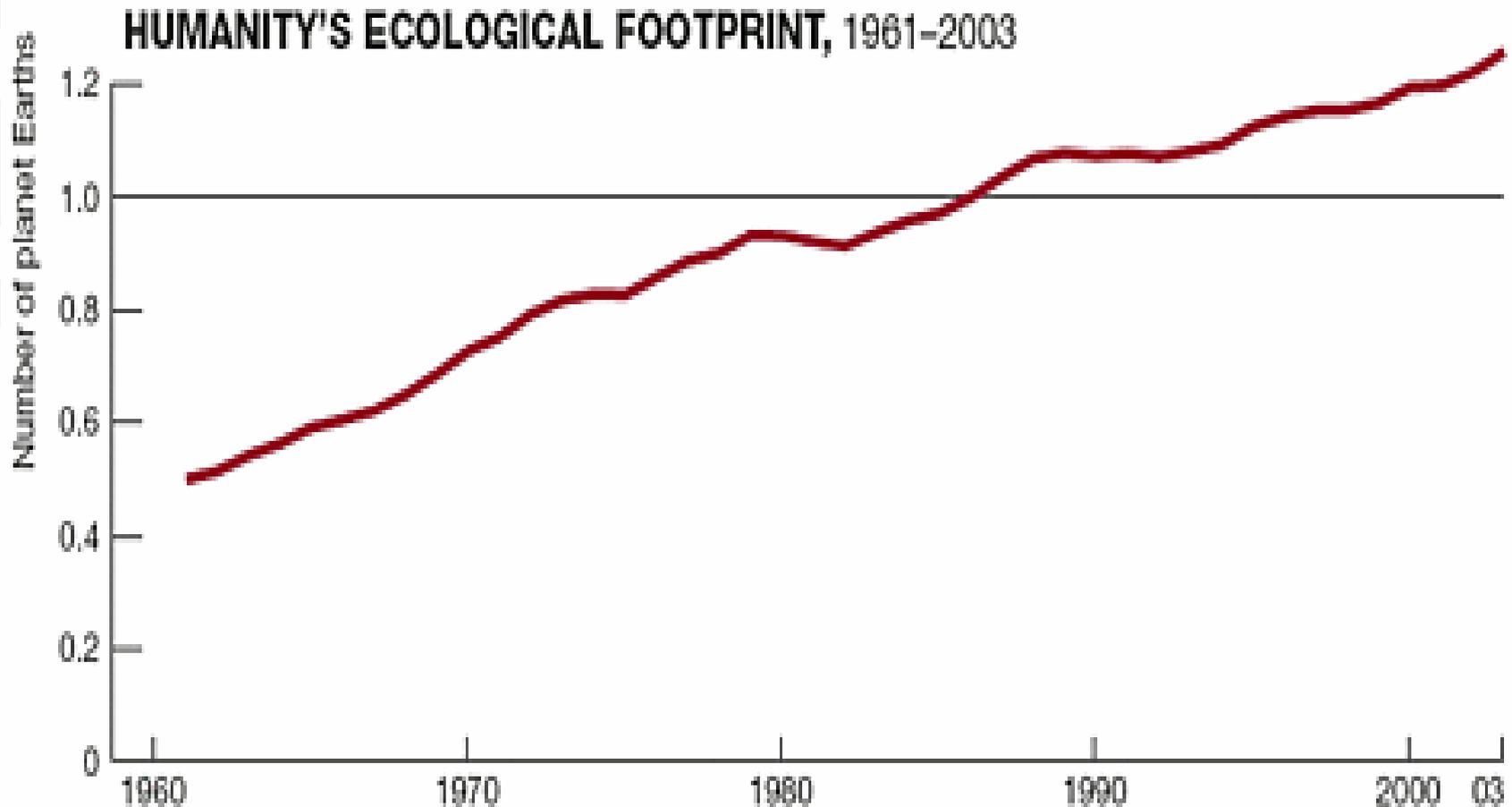
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# CRITICISMS 4

- Without free technologies and considerable funding and support, developing nations have no choice but to follow the only paradigm that is proven to be effective – western industrialization.
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# ECOLOGICAL FOOTPRINT

- Compares human consumption of natural resources with the planet's ecological capacity to regenerate them
- Assumes current technology levels, and looks at the amount of area needed to generate and to dispose of waste.



# ECOLOGICAL FOOTPRINT

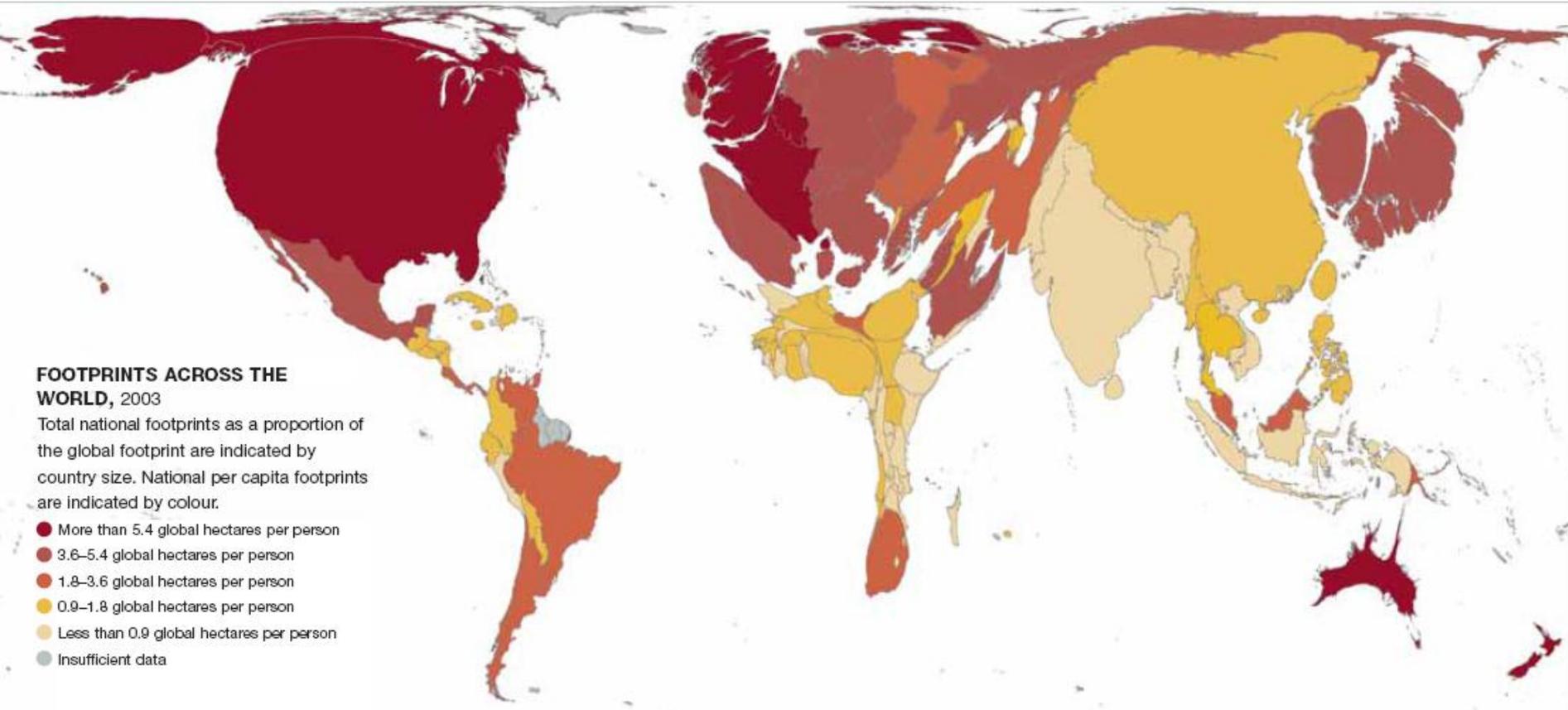
- Generally calculated in global hectares (gha)
- In 2003, average biologically active area was 1.8gha/person
  - US: 9.6gha per person
  - China: 1.6 gha per person
- Can be calculated for different entities:
  - Countries – assesses to what extent a nation uses more than the resources available within its territory.
  - Per capita – compares the individual usage with a sustainable and an equitable median value.
  - Per activity – life cycle analysis (e.g. building a car) assessing the amount of land and resources required for the process, and the corresponding.
- Exposes the extent of disparity between rich and poor to a much larger extent than actual money.

# GLOBAL FOOTPRINTS

## FOOTPRINTS ACROSS THE WORLD, 2003

Total national footprints as a proportion of the global footprint are indicated by country size. National per capita footprints are indicated by colour.

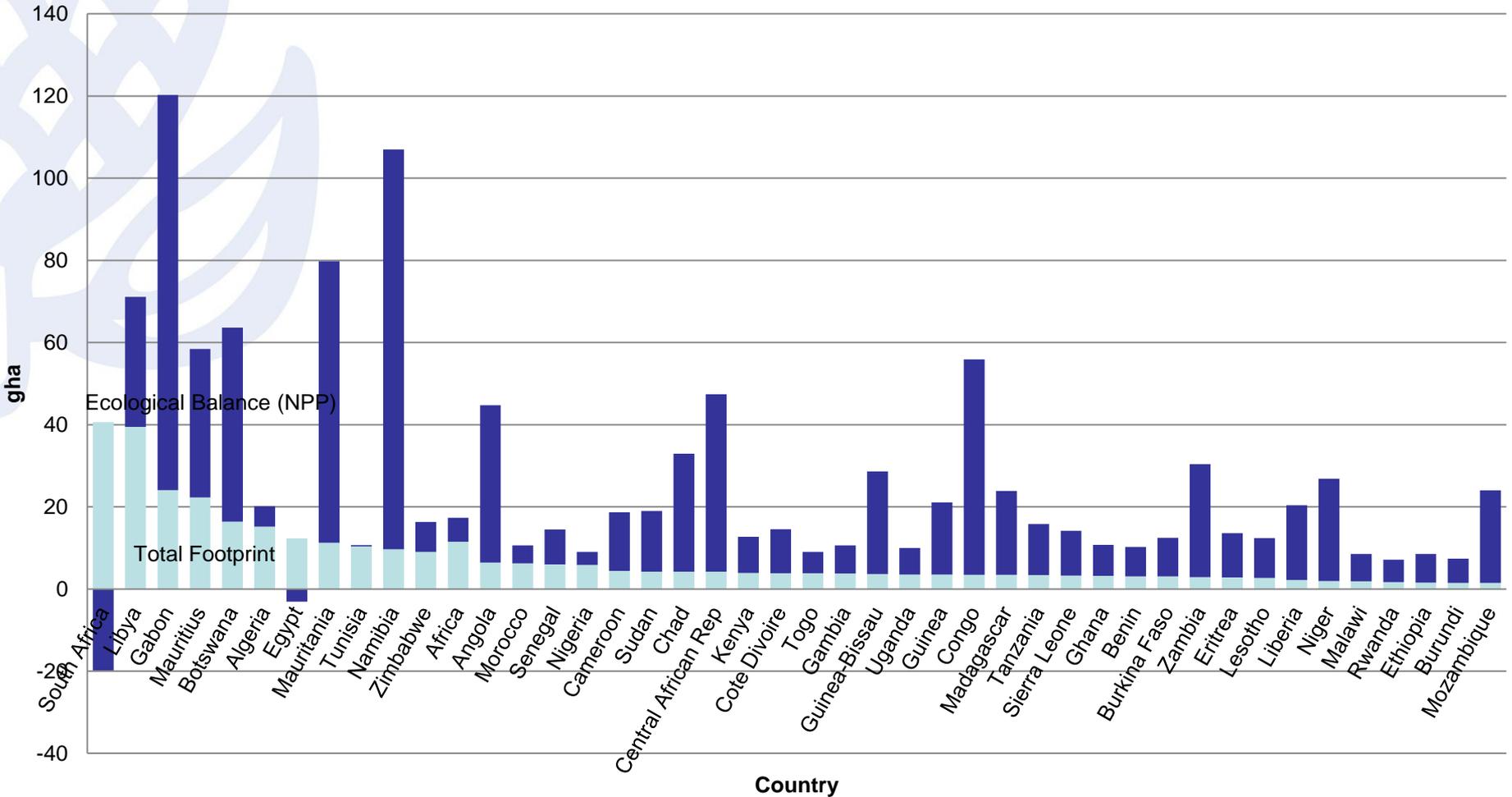
- More than 5.4 global hectares per person
- 3.6–5.4 global hectares per person
- 1.8–3.6 global hectares per person
- 0.9–1.8 global hectares per person
- Less than 0.9 global hectares per person
- Insufficient data



Source: WWF Living Planet Report 2006

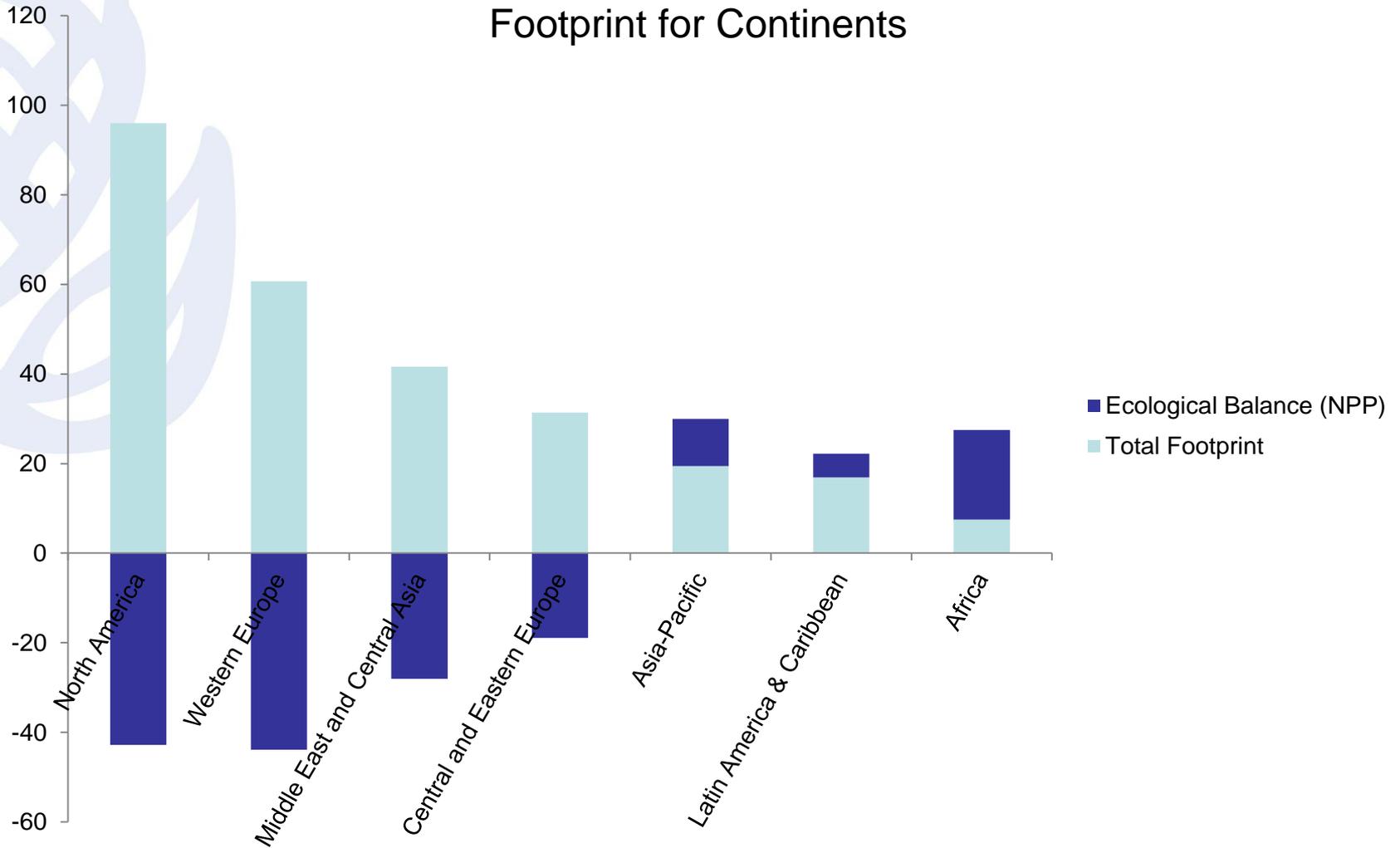
# PER CAPITA FOOTPRINTS

## Footprint for African nations



# PER CAPITA FOOTPRINTS

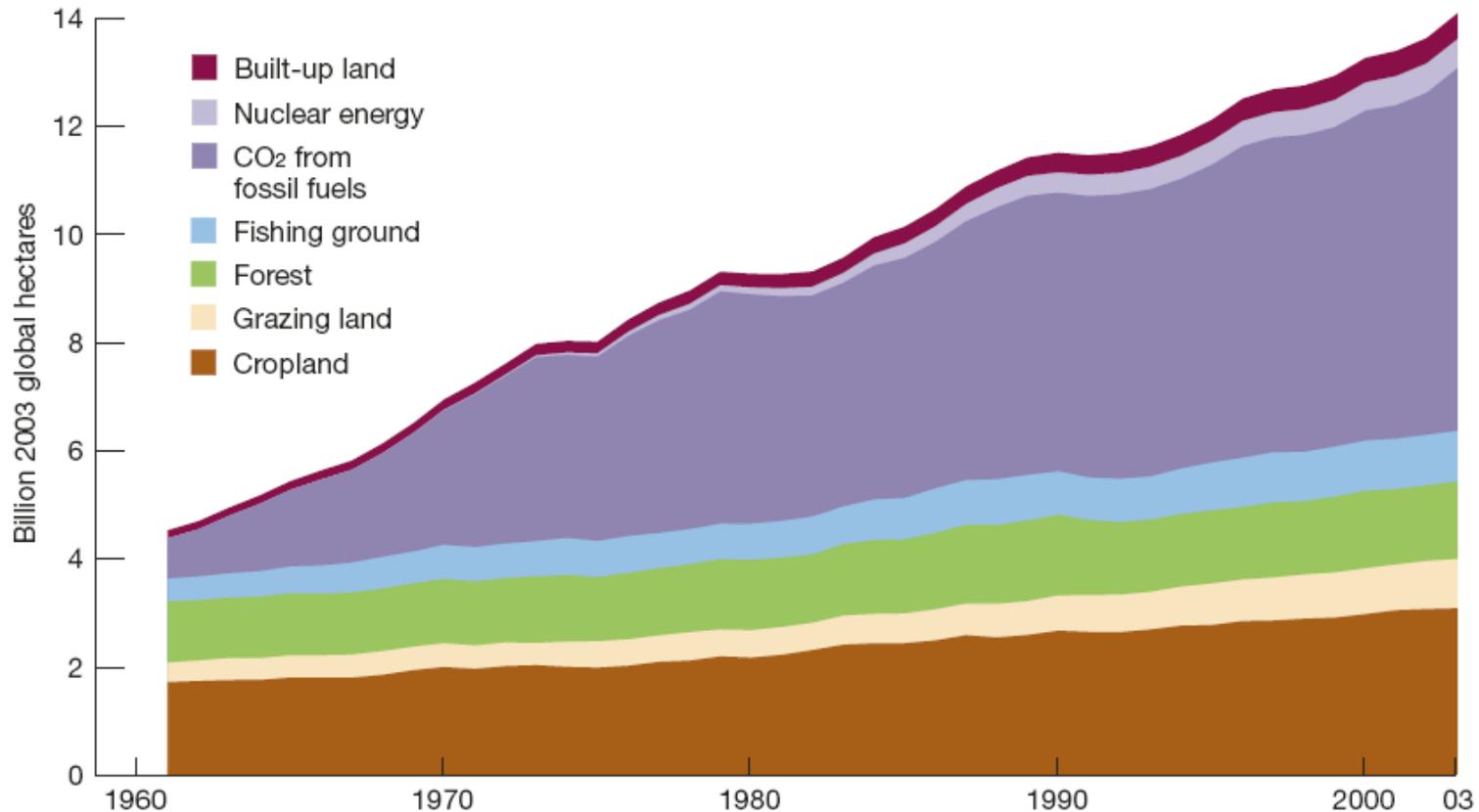
Footprint for Continents



# PROBLEMS

- Simple concept in principle, complex in practice
- Nuclear power?
- Fossil fuels
  - Considers the amount of land required for natural carbon sequestration of emissions (less oceanic uptake)

Fig. 19: **ECOLOGICAL FOOTPRINT BY COMPONENT, 1961–2003**



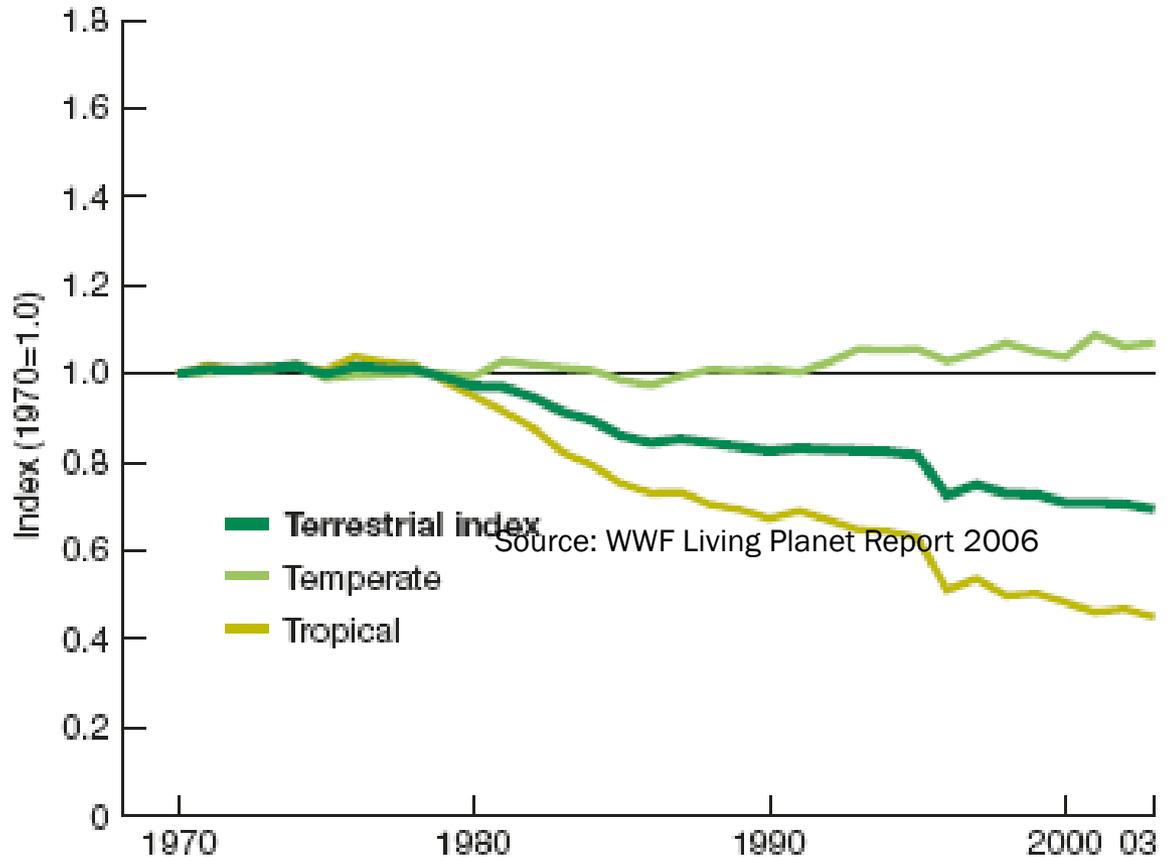
# PROBLEMS

- Hard to integrate global trade into EF in a way that reflects disparate usages.
- Urban areas are disproportionately high in consumption – in developed nations rural consumption can be very high as well, but this may not be reflected due to transport of goods to cities.
- Favours high-yield monocultures over natural areas – hence transformation of the land to agriculture actually reduces ecological footprint.
- This is countered by the WWF by integrating the Living Planet Index.

# LIVING PLANET INDEX

- Measures human impacts on biodiversity in different arenas (Terrestrial, Marine, Freshwater)
- Tracks populations of 1313 different vertebrate species as an indicator of general ecosystem wellness
- Indicates a decline of nearly 30% in all vertebrate populations since 1970.
- Impact greater in the tropics
- Clear indication that we are living off ecological capital, not the “interest”

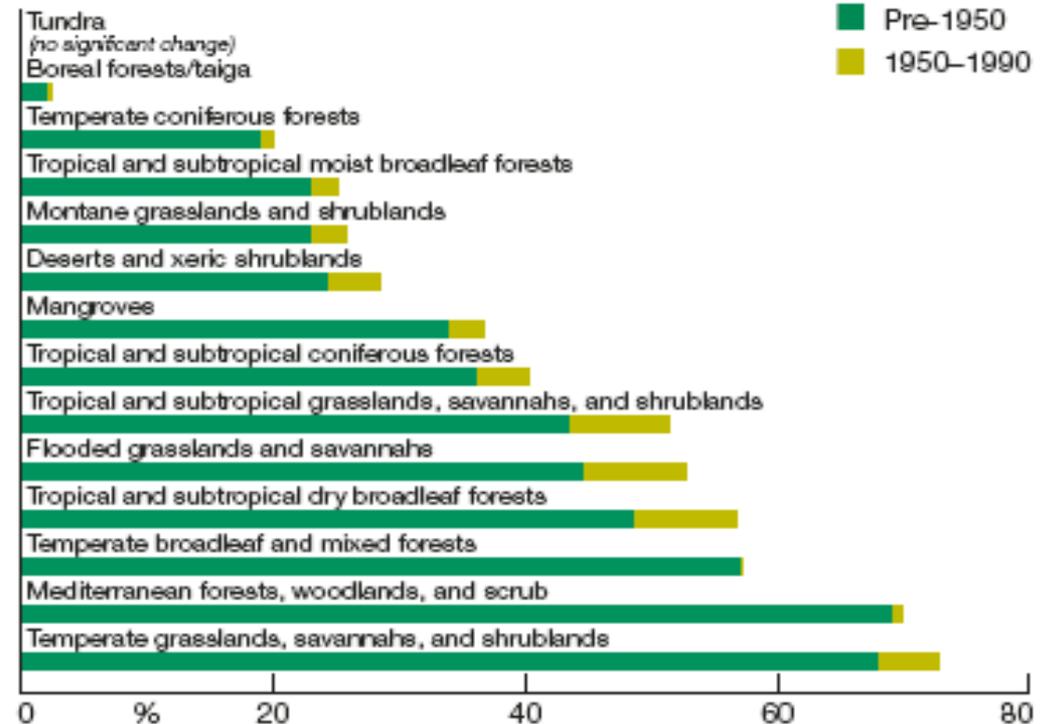
**TEMPERATE AND TROPICAL TERRESTRIAL LIVING PLANET INDICES, 1970–2003**



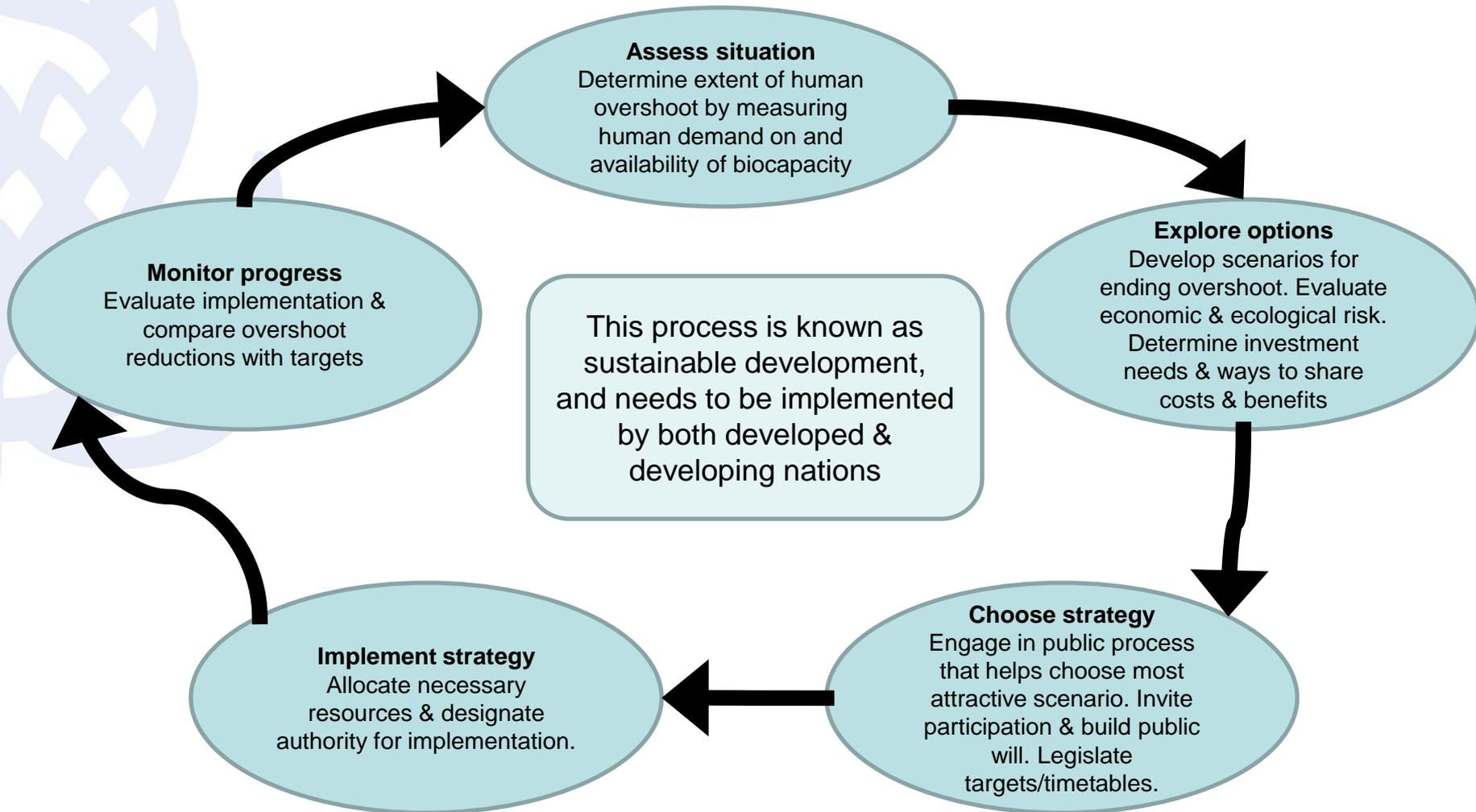
# LIVING PLANET INDEX

- Reducing global capacity for recovery.
- The ecological footprint and Living Planet index provide guidelines for the setting of reasonable targets.
- Feeds into Life Cycle Assessment for projects and development undertakings globally.
- Annual or biannual updates of these measurements provides for monitoring of the success of current projects.

**LOSS OF NATURAL HABITAT, BY BIOME, to 1990 (as % of estimated original area)**

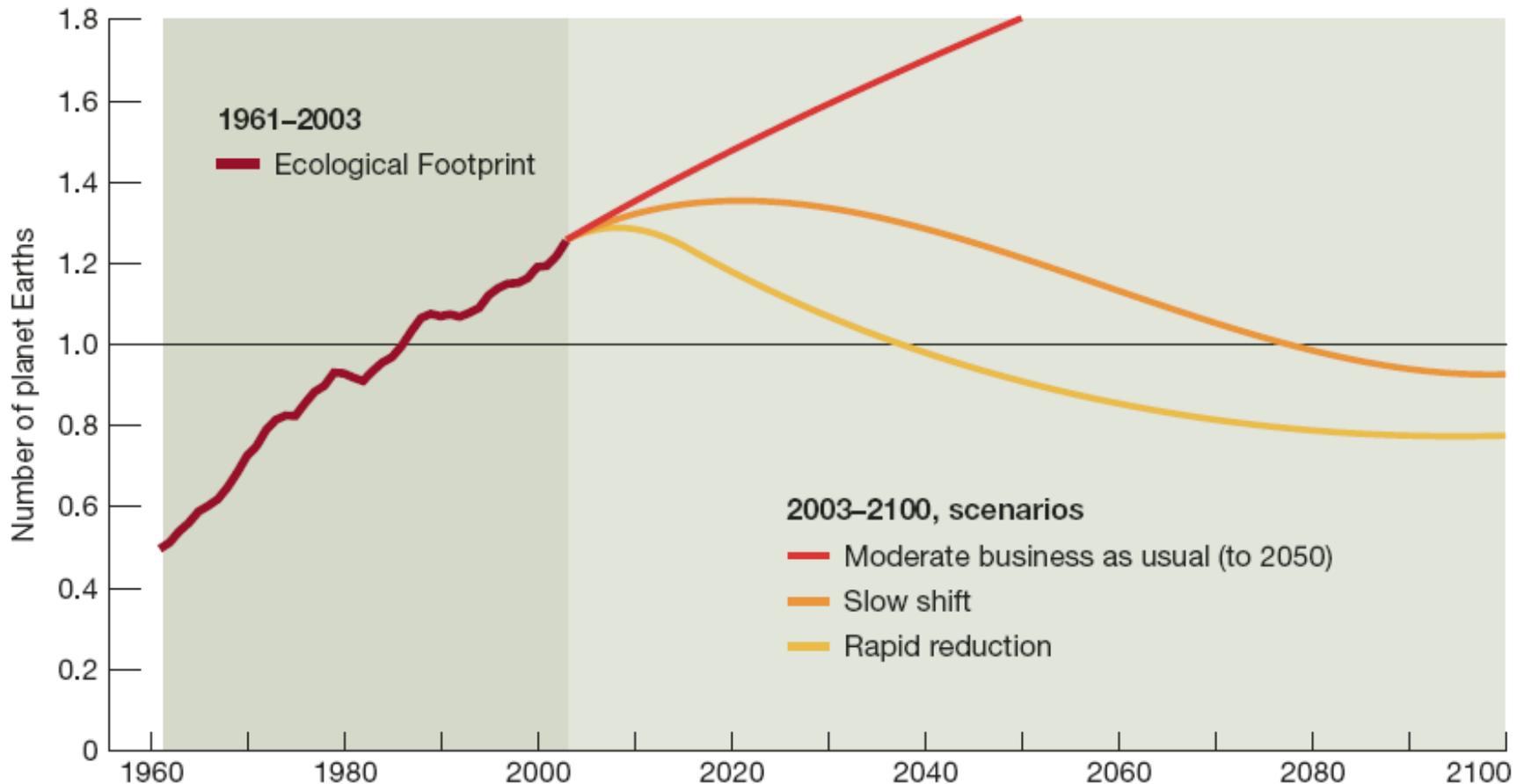


# DIGGING OUT OF THE HOLE



# DIGGING OUT OF THE HOLE

THREE ECOLOGICAL FOOTPRINT SCENARIOS, 1961–2100



# CONCLUSION

- Sustainable development presents development opportunities for developing nations, means for developed nations to achieve biodiversity targets through globalisation
- Requires political buy-in at all levels
- Holistic focus on development, integrating economy at micro- and macro- levels as well as social and ecological benefits
- Extremely hard to plan, tends to be hijacked for personal/political agenda
- Danger of ignoring certain essential conservation processes because of total societal/economic value still exists
- Sustainability is linked to measurement of current and future impacts, assessed through ecological footprint
- Living planet index addresses some of the shortcomings of the ecological footprint model
- Footprints allow assessment of the equity of resource use globally (moral & socio-economic value)