

Teaching Scientific Literacy for Sustainable Natural Resource Management

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"There is no such thing as philosophy-free science; there is only science whose philosophical baggage is taken on board without examination." Daniel Dennett 1995

Teaching Scientific Literacy for Sustainable Natural Resource Management

What are natural resources?

What is sustainable management?

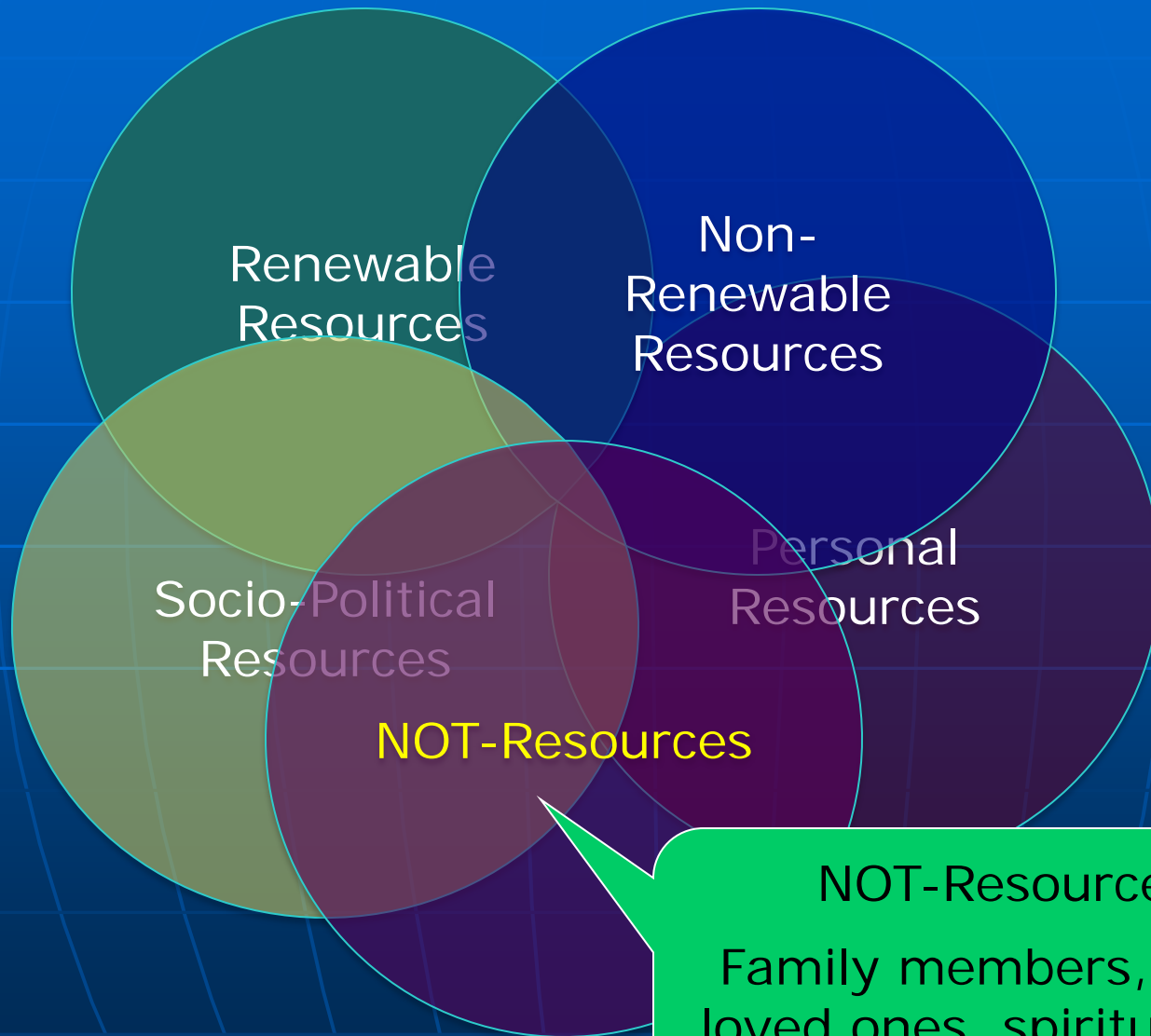
What is scientific literacy?

How can SL be taught and learned?

What makes these questions important?

Human Security depends on the sustainable availability of natural resources.

Problems with the Resource Concept



NOT-Resources can be:

Family members, friends, pets, loved ones, spiritually significant objects & rituals, deities, etc.

Problems with the Management Concept



Accept

Green revolution

Increased carrying capacity

Increased life expectancy

Standard of living

Modern stewardship

+ *ideological reasons*



Reject

Mixed track record

Cumulative 'rivet' effect of bad decisions

Hubris seems untimely

Who manages *H. sapiens*?

Motives are questionable

End state?

+ *ideological reasons*

Compromise:

Develop the concept towards long term sustainability

Unsustainable Behaviour Endangers All of Us

Economic
growth

Population
growth

Technological
expansion

Arms races

Growing
income
inequality

Increasing rates of
resource depletion

Increasing
consumption,
increasingly
inequitable

Pollution with
consequences on
climate, habitat
quality and public
health.

Increasing rates of
biodiversity loss

OVERSHOOT !

Politics in the Age of Overshoot

Cornucopianism

versus

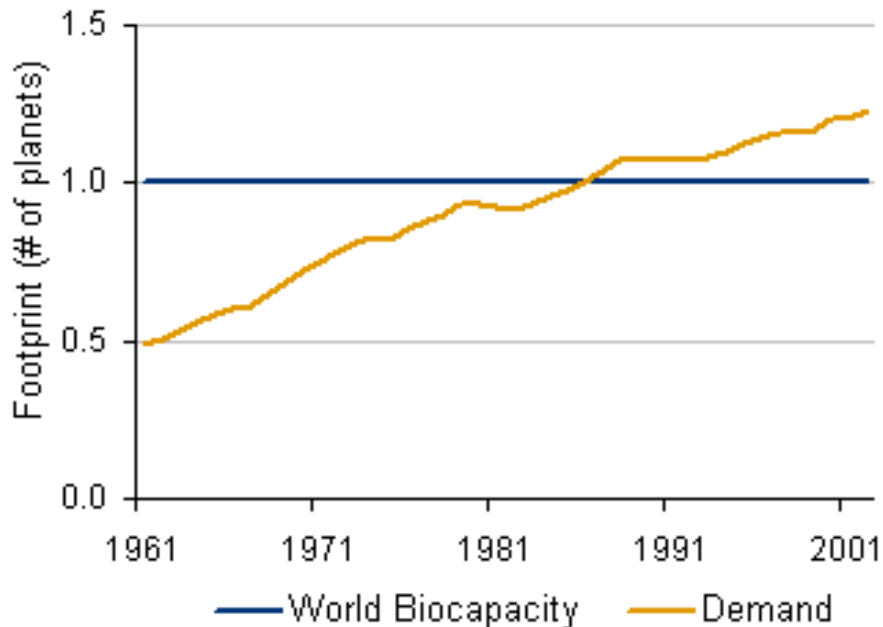
Scientific Literacy

CONSERVATIVE GOVERNMENT FOCUSED ON JOBS,
GROWTH, AND PROSPERITY

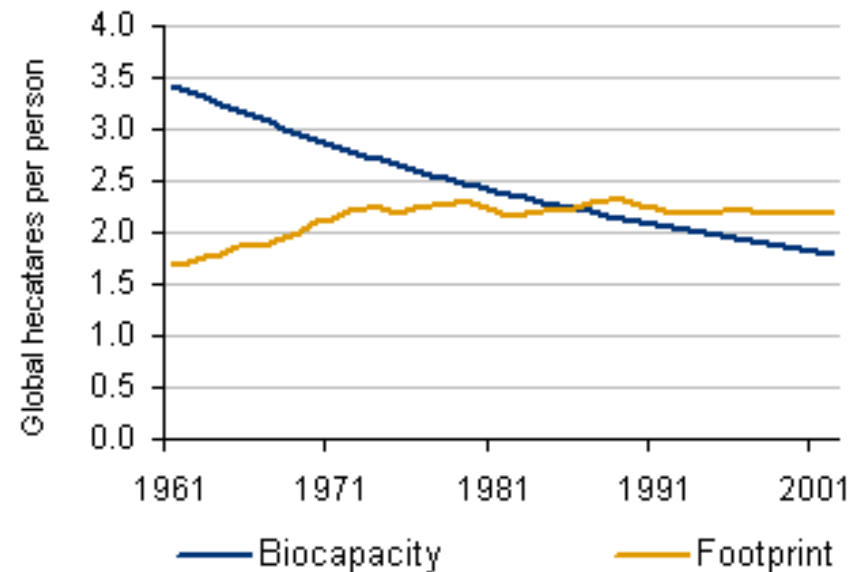
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Demand vs. Biocapacity



Footprint and Biocapacity



Forgive the affront – but:

“Would an ostensibly intelligent, forward-thinking, morally conscious, compassionate species continue to defend an economic system that wrecks its planetary home, exacerbates inequity, undermines social cohesion, generates greater net costs than benefits and ultimately threatens to lead to systemic collapse?”

W. Rees (2014:15)

Goals of Sustainable Resource Management

Moral ineptitudes

Failure of governments

Cognitive bias

Mental habits

Lack of scientific understanding (the "culture gap")

Goals of
Equity

Goals of
Efficiency

Goals of
Restraint

Goals of
Adaptation

Impediments in the Human Psyche

■ Perceptual / Cognitive Inabilities

- to perceive one's environment in a holistic way
- to extrapolate to global dimensions
- to extrapolate to the long term
- to detect gradual change
- To sift significant information from nonsense

■ Moral Ineptitudes

- negation of moral responsibility (external locus of control)
- lack of moral scruples and of self-efficacy

■ Mental Habits

- wishful thinking, self-deception, groundless optimism, and *akrasia* (weakness of will)

Scientific Literacy as a Network of Learning Outcomes

Affective Domain

- Explore which **values**, attitudes & beliefs will help and which will not
- Adopt an attitude of **critical caring**.
- Adopt a concept of **progress** that includes limits.
- **Active** involvement in mitigation → e.g. 5 Rs

Cognitive Domain

- **Analyse** ecologically the crisis and its causes, including capitalism.
- **Connect** the causes with individual life styles.
- Explore how life skills for **resilient** communities can reverse overshoot and address the obstacles.
- Encourage & enable learners for moral **reasoning**.

Scientific Literacy

“We need fully to understand and appreciate the viewpoint of a particular standard before we judge it as inadequate” (Gbadegesin 2009)

- Deliberate which moral goals, ideals and values enable us to establish the right priorities.
- Find a consensus on which factual beliefs, assumptions, models, metaphors and accepted bodies of knowledge help us make sense of the world.
- Examine which structural and legal constraints and incentives can channel our aspirations and expectations – and which obstruct them.
- Encourage critical thinking and self confidence.

Deconstructing the Dominant 'Modern' Concept of Progress

- Economic growth as a good in itself
- Cornucopianism
- Complacent optimism
- Omnipotence of science & technology
- Moral nihilism & materialism
- Consumerism
- Freedom from 'nature' and dominion over it
- Neoliberal individualism



Help!!

- Awareness of our dependence on 'nature'
- Awareness of our integration within the natural environment
- Awareness of the limits to consumption and to technological development
- Concern for future generations
- Respect for 'nature'
- Relevant critical skills

Critical Scientific Literacy can help us achieve education for sustainability

(Lautensach 2010)

1. Adopt a concept of progress that is informed by sustainability within systemic limits
2. Replace anthropocentrism with an ecocentrist environmental ethic
3. Acquire the requisite cognitive and affective skills
4. Acquire a vision for and awareness of the future that includes change and sustainable solutions
5. Adopt a non-parochialist view of environmental values and academic inquiry
6. Become liberated from exploitative dependencies.

Goals for Teacher Candidates at the UNBC School of Education

- **Scientific literacy**: cognitive learning outcomes
- **Scientific literacy**: affective learning outcomes
- **Human ecology**: deconstructing the myth of the human-nature divide (*'human exceptionalism'*)
- **Critical thinking and reflection**: skills&attitudes; ask "And then what?" and "Who benefits?"
- Discuss **progress** and **resilience** with their students in all subjects and grades
- Evaluate the BC curriculum, **strengthen** its sustainability outcomes, mitigate harms
- **Active involvement in mitigation and advocacy**

The Resolving Power of Scientific Literacy: an Example

ECONOMICS

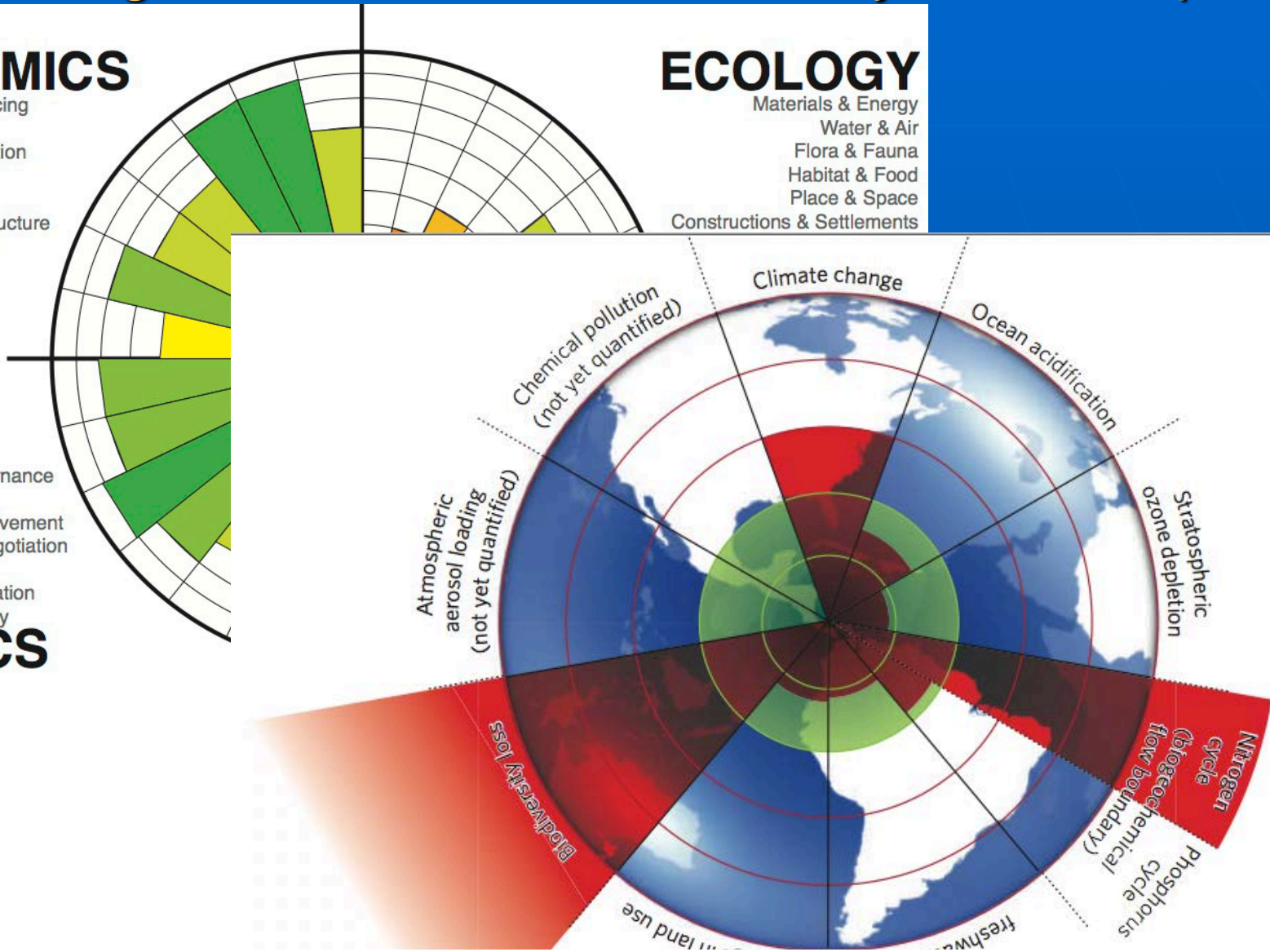
Production & Resourcing
Exchange & Transfer
Accounting & Regulation
Consumption & Use
Labour & Welfare
Technology & Infrastructure
Wealth & Distribution

Organization & Governance
Law & Justice
Communication & Movement
Representation & Negotiation
Security & Accord
Dialogue & Reconciliation
Ethics & Accountability

POLITICS

ECOLOGY

Materials & Energy
Water & Air
Flora & Fauna
Habitat & Food
Place & Space
Constructions & Settlements



Nine-Boundaries Model of
Humanity's Safe Operating Space (Rockström et al 2009)

Five 'fundamental variables' determine whether a society survives

(Diamond 2005)

- Environmental damage
- Climate change
- Hostile neighbours
- Friendly trade partners
- **Society's responses to its problems**

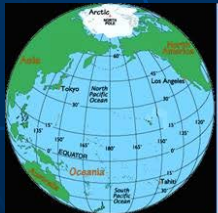
*Attitudes
Values
Beliefs
Norms
Ideals of
Critical
Scientific
Literacy!*

What determines those responses?

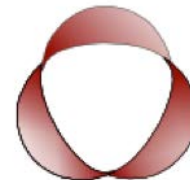
Thank You!

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