17.181/17.182
SUSTAINABLE DEVELOPMENT
Week 4 Outline
Cyberspace and Sustainability

1. **ISSUES left over from WEEK 3**
   - **Brief Review**
   - **Some Empirical Views**

2. **CYBERSPACE – Relevance to Sustainability?**
   - **Critical Features**
   - **Knowledge Aggregation and Facilitation**
   - **Revolution – Four Cases in the Middle East****

3. **GLOBAL SYSTEM for SUSTAINABLE DEVELOPMENT**
   - **Reducing Barriers to Knowledge**
   - **Structure of Sustainability-Knowledge**
   - **Contributing to knowledge via submit site**

`

17.181/17.182
SUSTAINABLE DEVELOPMENT
Week 4 Outline
Cyberspace and Sustainability

1. **ISSUES left over from WEEK 3**
    - **Brief Review**
    - **Some Empirical Views**

2. **CYBERSPACE – Relevance to Sustainability?**
    - **Critical Features**
    - **Knowledge Aggregation and Facilitation**
    - **Revolution – Four Cases in the Middle East****

3. **GLOBAL SYSTEM for SUSTAINABLE DEVELOPMENT**
    - **Reducing Barriers to Knowledge**
    - **Structure of Sustainability-Knowledge**
    - **Contributing to knowledge via submit site**

Brief Review

The view of sustainable development in this course:

Centers on **human activities,** and places human beings

in **social systems** at its core, embedded in **the natural system** and in **cybersystems.**

Sustainable development is **driven by events** in the

real world – not by revolution in academia or by theoretical

conditions

- Forced to **reconsider** the theoretical foundations growth models.

- **Different views** depending on underlying conditions

Sustainability for System of Systems

Human Society

Natural Environment

Cyberspace

The Conceptual Core –
High Level Definition

We define sustainable development as:

- **The process of meeting the needs of <u>current</u> and <u>future</u> generations**

- Without undermining

- **The resilience of the life-supporting properties of <u>nature</u> and the integrity (or cohesion) of <u>social</u> systems.**

What does this mean?

Spiralling up
World population, bn

Forecast Source: UN Population Division
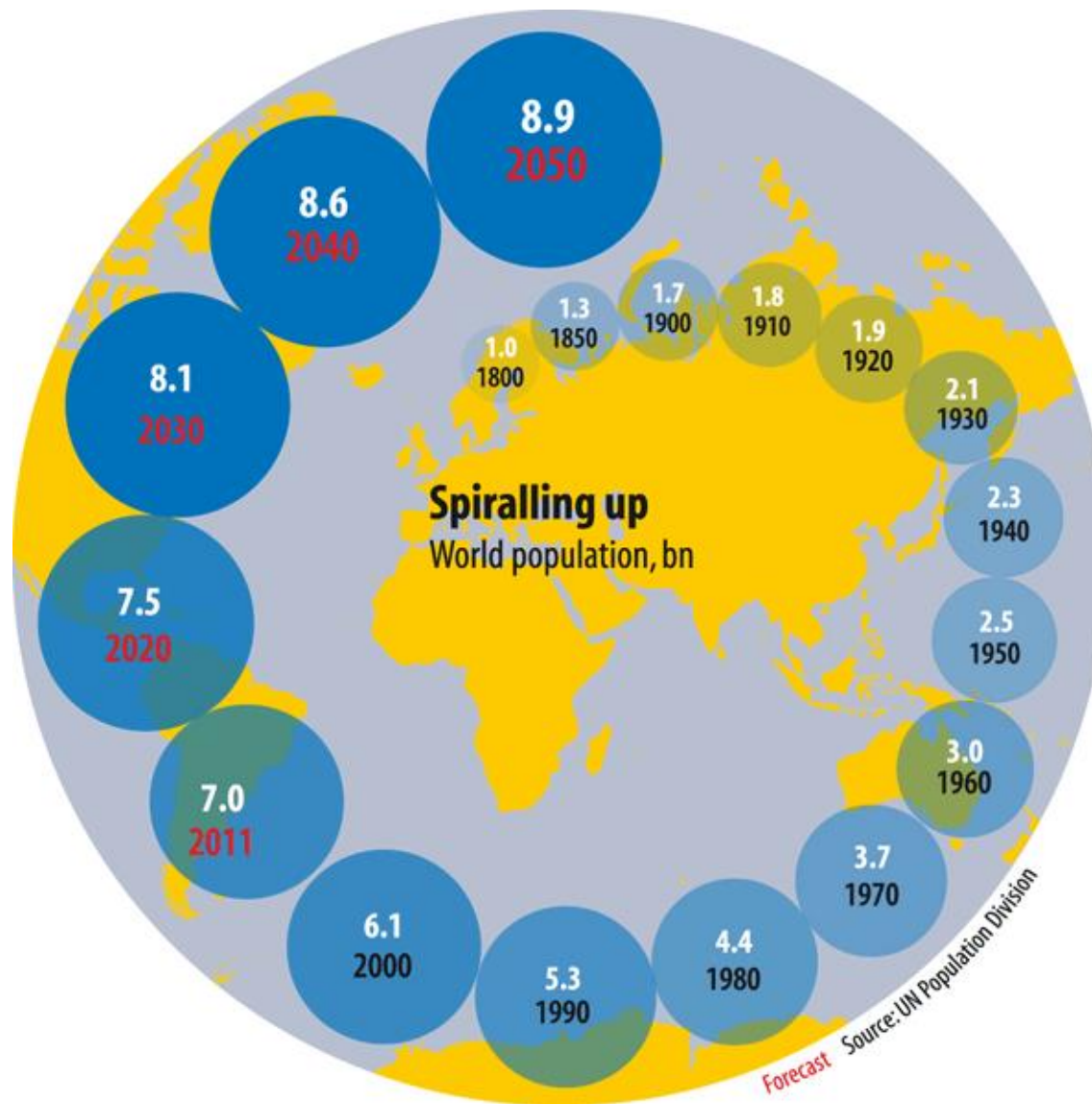
Parker, John. "Another Year, Another Billion." *The Economist*, November 22, 2010. © The Economist Group. All rights reserved.
This content is excluded from our Creative Commons license. For more information, see https://ocw.mit.edu/help/faq-fair-use/.

The automotive technology system as seen through the lens of an industrial ecology view.

Social Structure — (i.e. dispersed communities and businesses, malls)
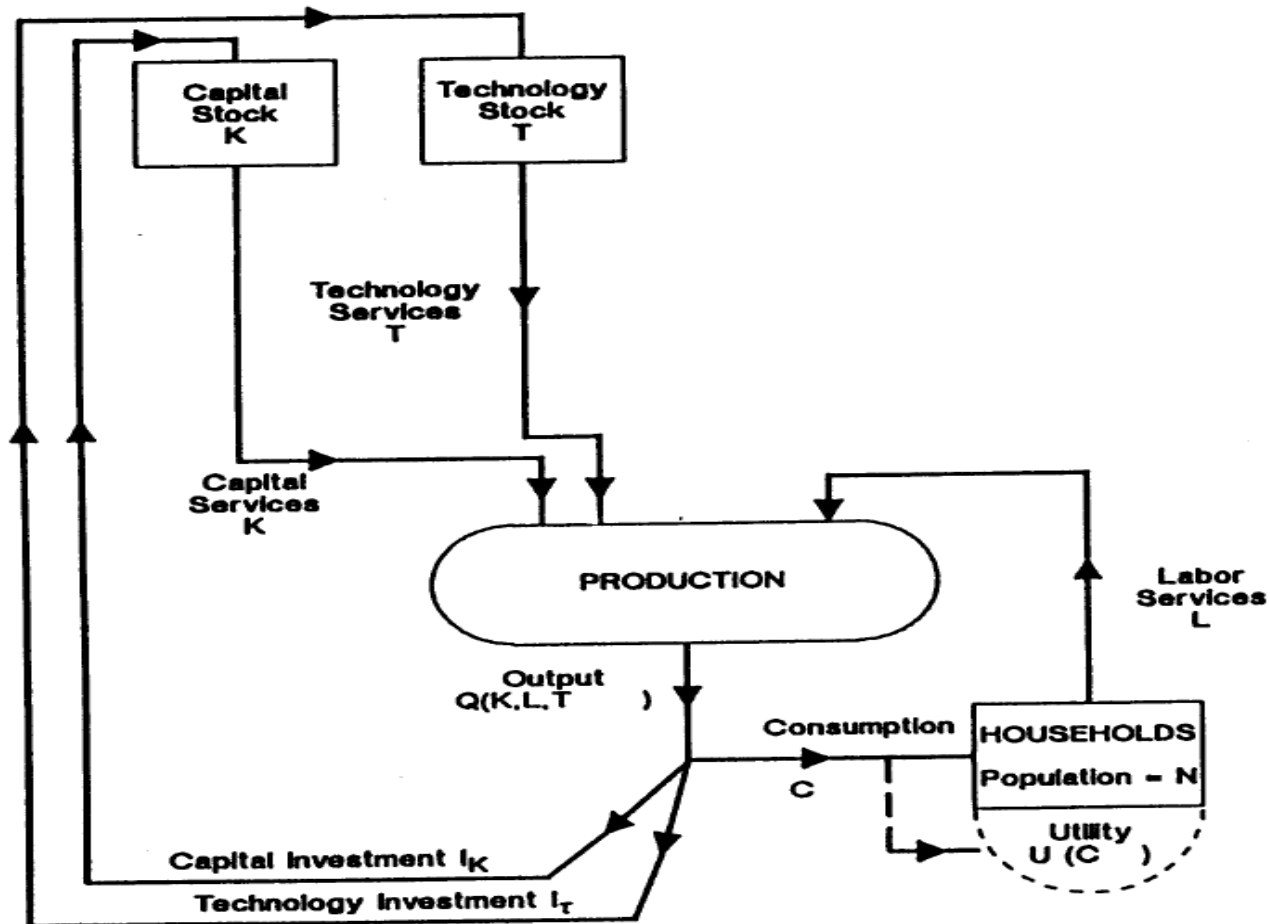
Infrastructure Technologies — Built Infrastructure (i.e. highways) / Supply Infrastructure (i.e. the petroleum industry)

The Automobile — Manufacture, use, recycle

Automobile Subsystems — (i.e. the engine)
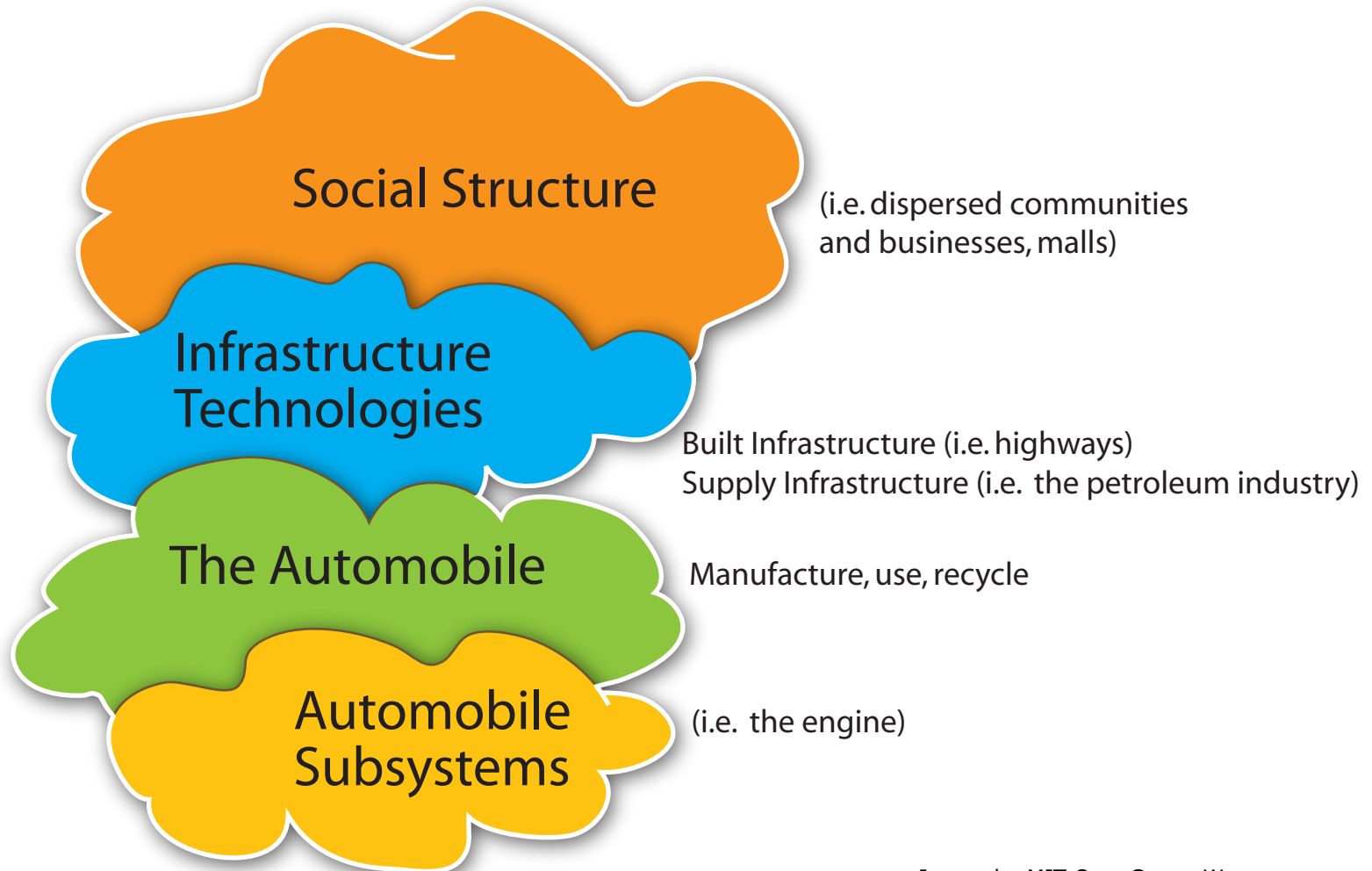
Image by MIT OpenCourseWare.

Figure 4–2. Subjective Well-being and Per Capita Income, 2000
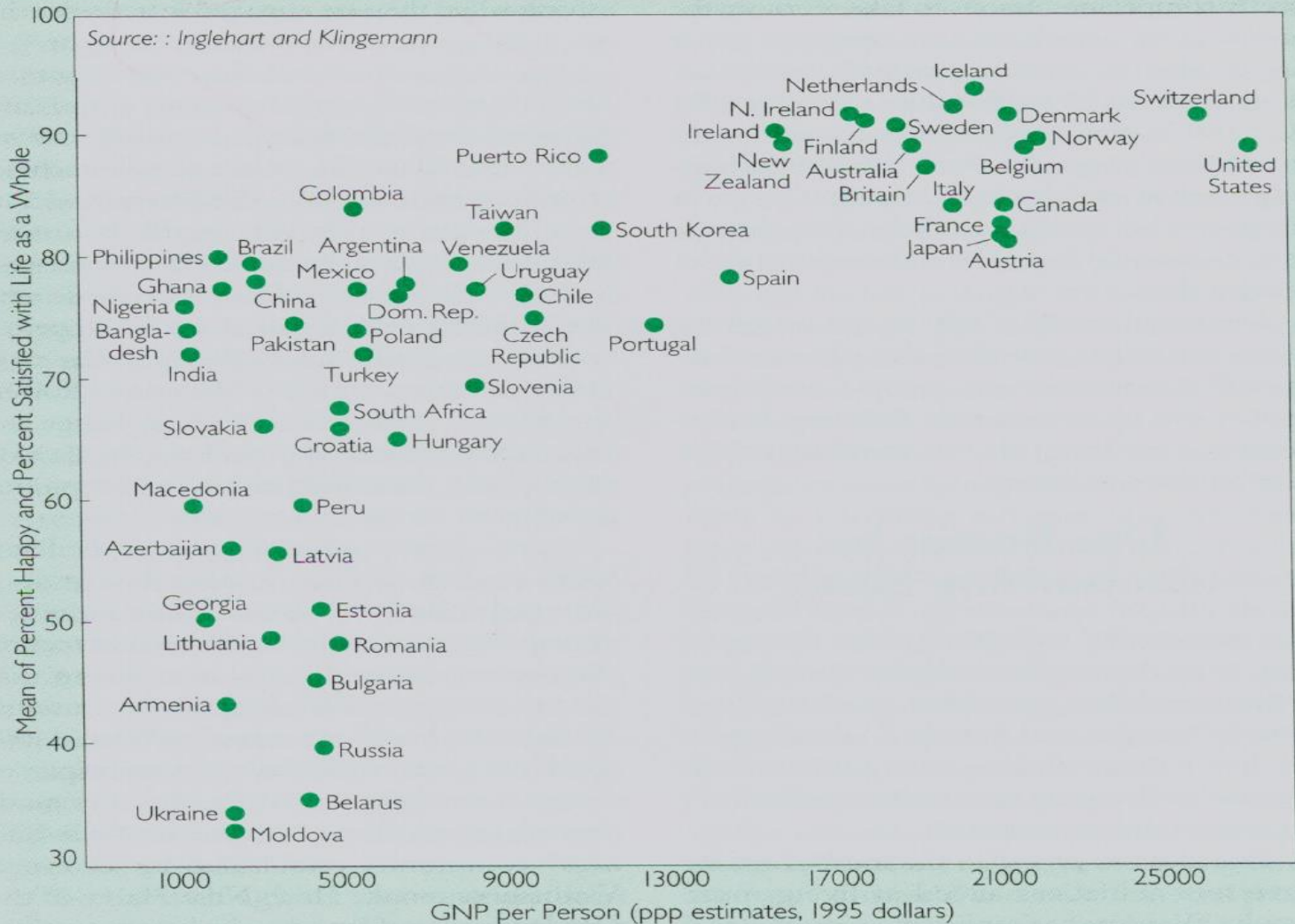
Figure 3–1. Waves of Innovation
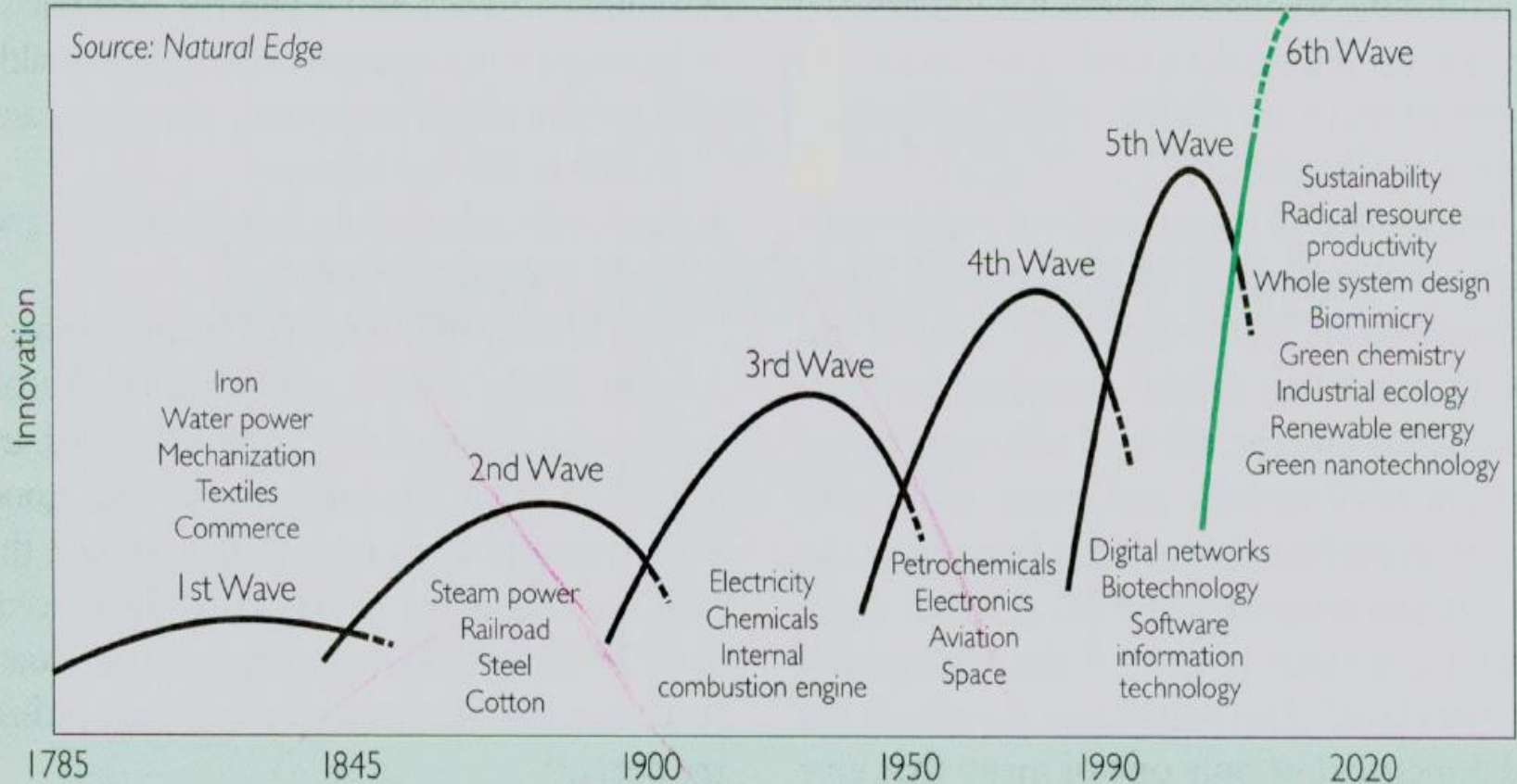
Source: Natural Edge

1st Wave
- Iron
- Water power
- Mechanization
- Textiles
- Commerce

2nd Wave
- Steam power
- Railroad
- Steel
- Cotton

3rd Wave
- Electricity
- Chemicals
- Internal combustion engine

4th Wave
- Petrochemicals
- Electronics
- Aviation
- Space

5th Wave
- Digital networks
- Biotechnology
- Software
- information technology

6th Wave
- Sustainability
- Radical resource productivity
- Whole system design
- Biomimicry
- Green chemistry
- Industrial ecology
- Renewable energy
- Green nanotechnology

1785   1845   1900   1950   1990   2020

Figure 2: A PURELY ECONOMIC MODEL

Pezzey, John. "Economic Analysis of Sustainable Growth and Sustainable Development." Working Paper No. 15. World Bank Policy Planning and Research Staff, Environment Department, 1989. © World Bank Policy Planning and Research Staff, Environment Department. All rights reserved. This content is excluded from our Creative Commons license. For more information, see https://ocw.mit.edu/help/faq-fair-use/.
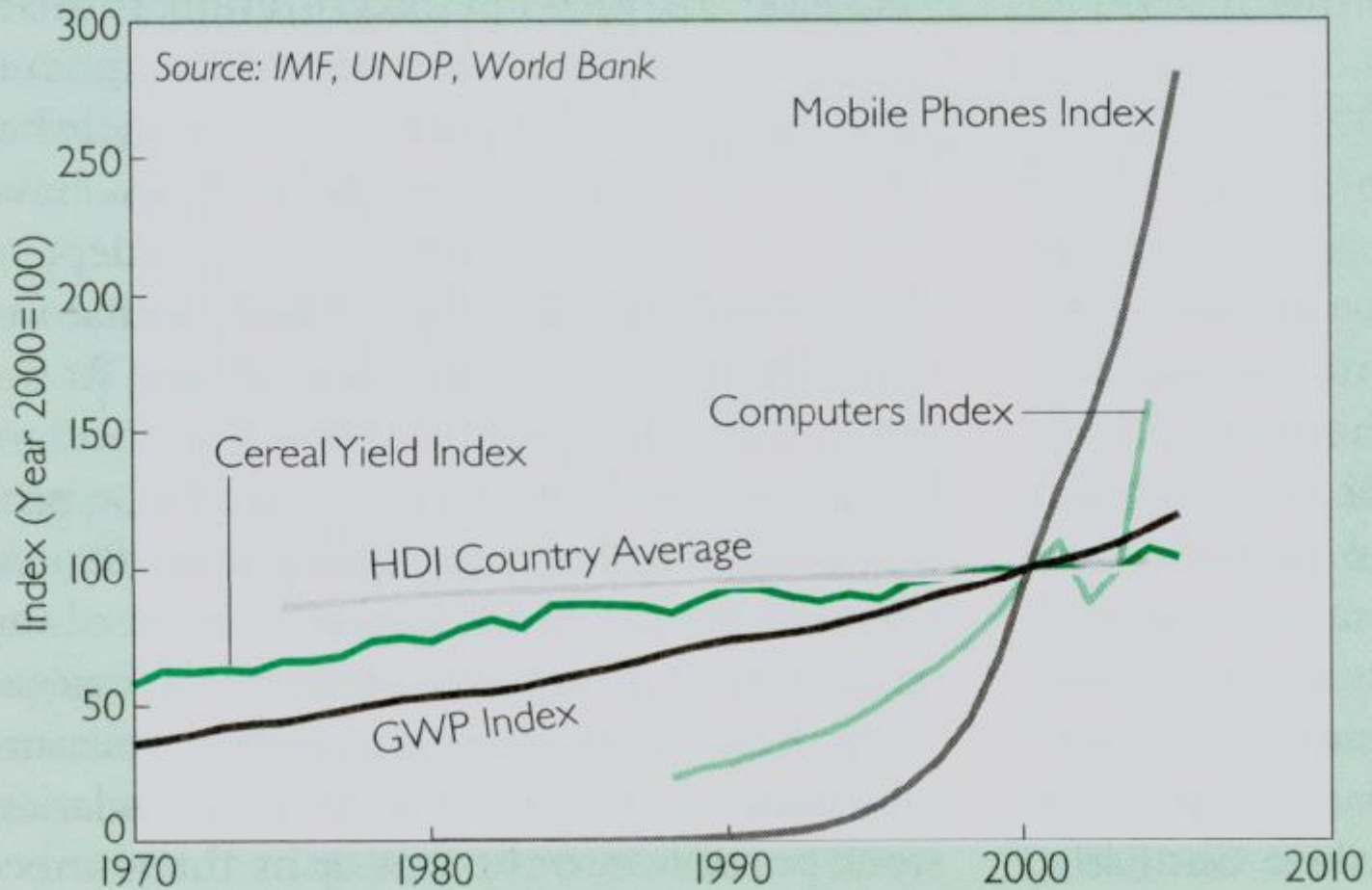
Figure 2–1. World Indicator Trends, 1970–2005

Source: IMF, UNDP, World Bank

Mobile Phones Index

Computers Index

Cereal Yield Index

HDI Country Average

GWP Index

Index (Year 2000=100)

The Simple Metric

- **Loads vs. Capabilities**

  If Loads are equal to or less than Capabilities, then the system could be sustainable

- **But what if Capabilities are greater than the Loads?**

17.181/17.182
SUSTAINABLE DEVELOPMENT
Week 4 Outline
Cyberspace and Sustainability

1. **ISSUES left over from WEEK 3**
   - **Brief Review**
   - **Some Empirical Views**

2. **CYBERSPACE – Relevance to Sustainability?**
   - **Critical Features**
   - **Knowledge Aggregation and Facilitation**
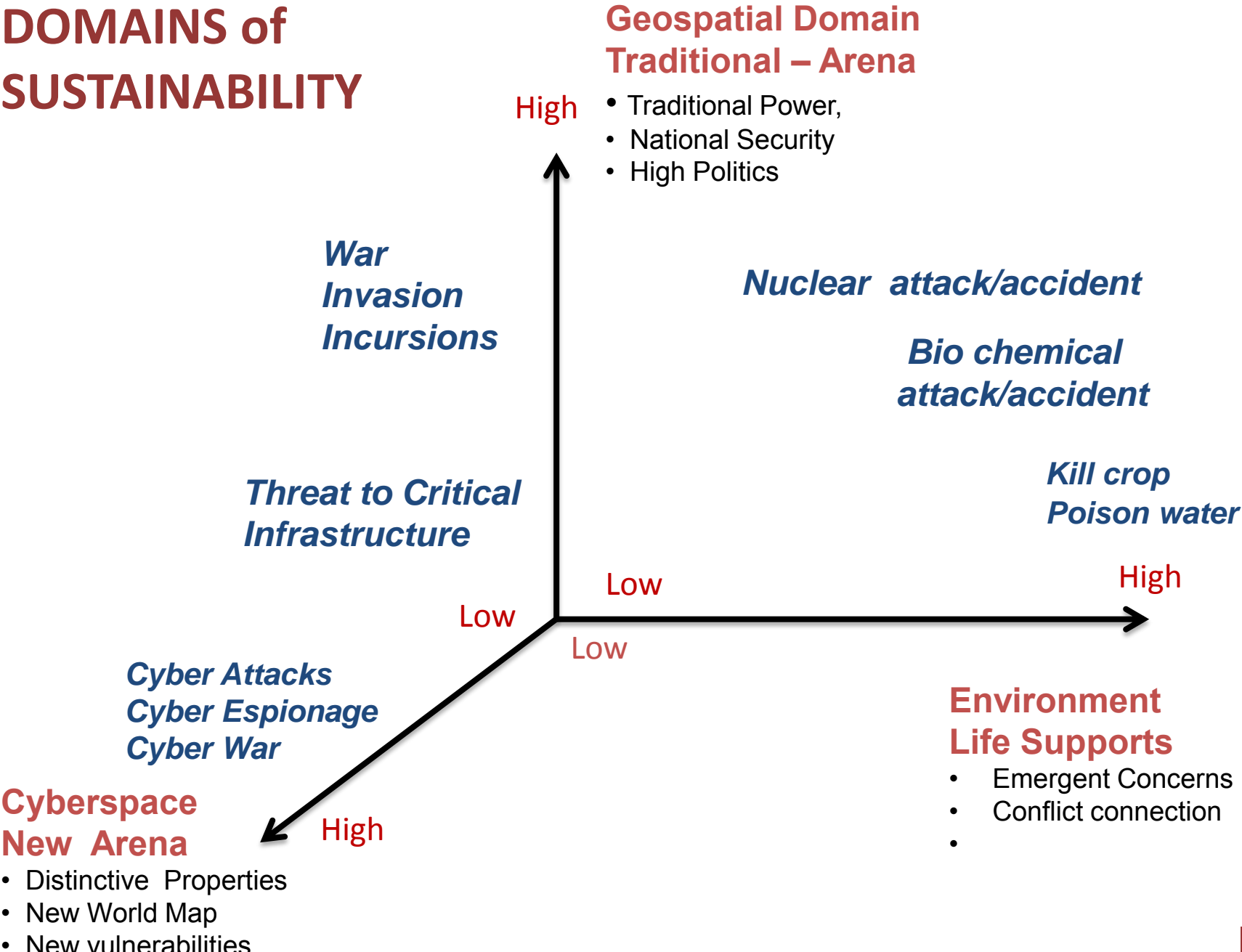   - **Revolution – Four Cases in the Middle East****

3. **GLOBAL SYSTEM for SUSTAINABLE DEVELOPMENT**
   - **Reducing Barriers to Knowledge**
   - **Structure of Sustainability-Knowledge**
   - **Contributing to knowledge via submit site**

CYBERSPACE - "Space" for Human Interaction

- Created through interconnection of millions of computers by global network such as the Internet.
- Built as layered construct, where physical elements enable a logical framework of interconnection
- Permits processing, manipulation, exploitation, augmentation of information, & interaction of people & information.
- Enabled by institutional intermediation & organization
- Characterized by decentralization & interplay among actors, constituencies & interests.

DOMAINS of SUSTAINABILITY

Geospatial Domain Traditional – Arena

High

- Traditional Power,
- National Security
- High Politics

War
Invasion
Incursions

Nuclear attack/accident

Bio chemical attack/accident

Kill crop
Poison water

Threat to Critical Infrastructure

Low   High

Low

Low

Cyber Attacks
Cyber Espionage
Cyber War

Environment Life Supports

- Emergent Concerns
- Conflict connection
-

Cyberspace New Arena

High

- Distinctive Properties
- New World Map
- New vulnerabilities

Nazli Choucri
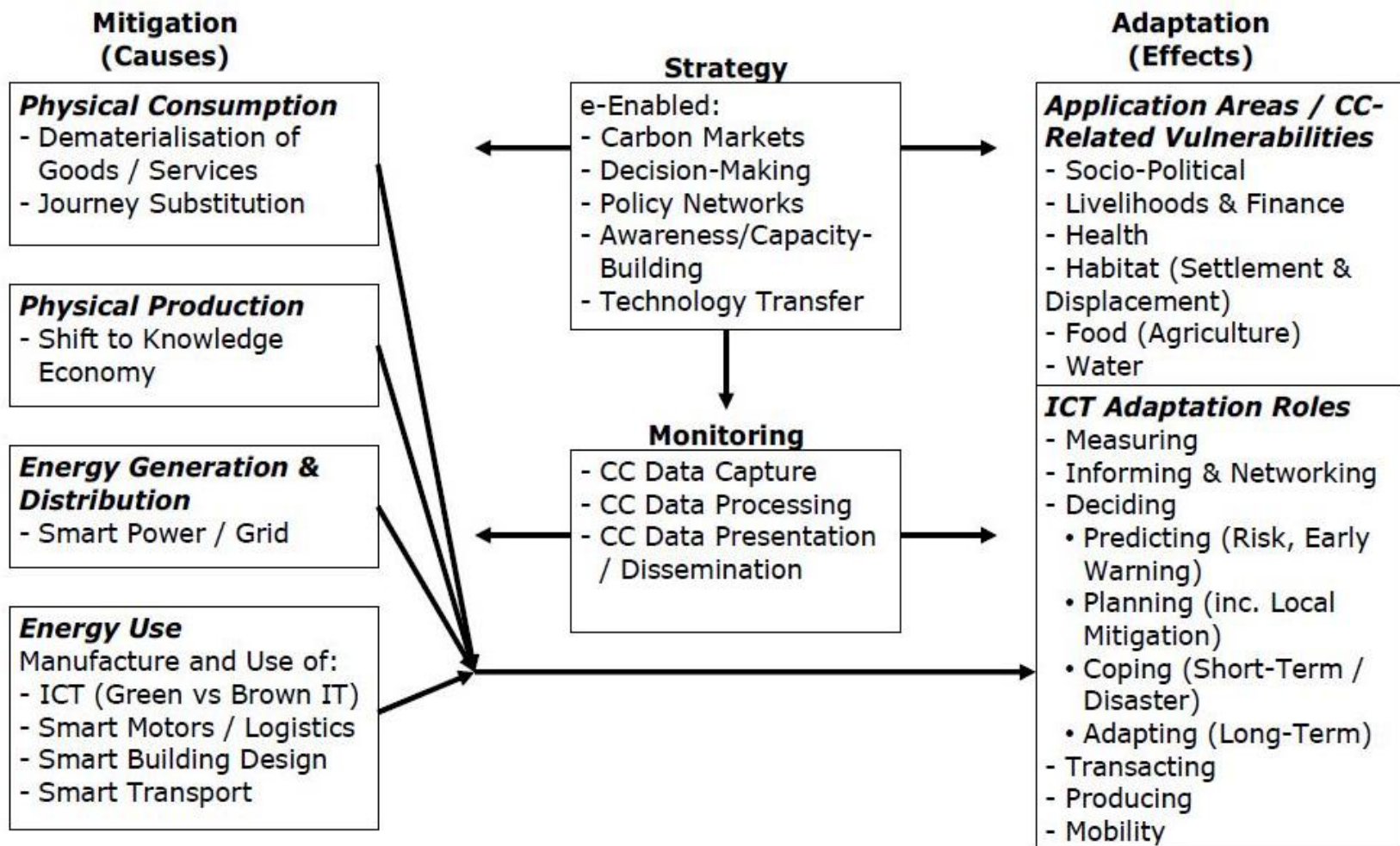
Situating Cyberspace

16

Decision Actors for Cyberspace

Some examples

- **Internet Service Providers**
- **Exchange Point Managers**
- **International Institutions**
- **New Cyber-focused Institutions**
- **Informal Institutions & Entities**
- **Non-State Actors & Associations**
- **Many others**

Figure 2: Overview Model on ICTs, Climate Change and Development

Barriers to Knowledge on Sustainable Development – Cyber Era

1. Ambiguity of "Sustainability" as Concept
2. Explosion of Information
3. Gaps in Digital Capabilities
4. Impediments to Provision of Knowledge
5. "Knowledge-Bias" from Developed States
6. The Matter of Language on the Internet

Relevance to Sustainability?

WHAT MUST BE DONE?

GENERIC and ESSENTIAL?

DE-MASSIFICATION
DE-SPACIALIZATION
DE-CENTRLIZATION
DIS-AGGREGATION
DE-NATIONALIZATION
DIS-INTERMEDIATION

Once More
Cyber Challenges to the State
Salient Features of Cyberspace

- **Time**   **Replaces conventional time with near-instantaneity**
- **Space**   **Transcends constraints of geography & physicality**
- **Permeation**   **Penetrates boundaries & jurisdictions**
- **Fluidity**   **Sustains persistent shifts & reconfigurations**
- **Participation**   **Reduces barriers to political expression & behavior**
- **Attribution**   **Obscures identity of actor & links to action**
- **Accountability**   **Bypasses usual mechanisms of responsibility**

Social science assumptions, theories, methods, and tools
 are not designed for such "reality" –
WANTED: Relevant Knowledge

17.181 / 17.182 Sustainability: Political Economy, Science, and Policy
Fall 2016