CST 310 / SER 417: Population, Space & Environment

Spatial Approaches in Population Studies: Analytical Methods and Representation Techniques

Approaches to population–environment research

Silvana Amaral
Antonio Miguel V. Monteiro

{silvana.amaral@inpe.br, miguel.monteiro@inpe.br}

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Introdução

- Qual o argumento???

Explicações monocausais:

- Supersimplifica a realidade complexa
- traz mais perguntas que respostas
- apresentam respostas erradas

Questões mais complexas- como as mudanças na pop se relacionam com as mudanças no ambiente.?

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Introdução

- Qual o objetivo/ proposta do artigo ???

Como demógrafos e cientistas sociais buscaram entender as relações entre dinâmicas de pop (e.g., population size, growth, density, age and sex composition, migration, urbanization, vital rates)

E mudanças ambientais.

- Estudos de micro e meso escala

- REVISAO: teorias PE
- Casos de estudo: LUCC degradação agrícola, recursos hídricos, energia e poluição ar, ClimaChange CC

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1. Tendencias Globais -- Pop – Consumo

- Qual o ponto?

Driver de Pegada ecológica – Pop e Consumo

Tamanho POP - fertilidade e mortalidade

Consumo - f(condição econômica)

- indicadores GDP, CO2 >>> países desenvolvidos

Projecões:

(-) cresc pop, (+) consumo, (-) evolução tecnológica

➔ (-) crescimento econômico

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2. Teorias P - E

- Neo-Malthusianismo - ignora a adaptação cultural, desenvolvimentos tecnológicos, comércio e arranjos institucionais que permitiram populações humanas a crescer além da sua localidade base de subsistência.
- IPAT = environmental impacts (I), product of population (P), affluence (A), and technology (T) - não considera interacao entre variáveis, (e,g organizacao social)

- Hipótese Boserupiana (Esther Boserup) - Malthus vê tecnolgia como exogenous à condicao (recurso) da pop e Boserup vê como endôgeno

- Teoria de Cornucopian – criatividade (solução a problemas) e substituição de mercado evitarão crises → fracassos de mercado e tecnologia inadequada são mais responsáveis pela degradação q o cresc pop

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2. Teorias P - E

- **Ecologia Política** – POBREZA – é o link entre P E, (países desenvol/under)
- Ex. migrantes em desmatamento hotspot – vítimas do processo de apropriação da terra , ou repostas às desigualdades dos países → sintomas de desequilíbrios mais profundos
- Ex. degradação da terra-> falta de acesso a tecn e crédito. (mais q cres pop)

- Cresc Pop -> exacerba condições – na governança, conflitos, políticas distorcidas

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2. Teorias P - E

Modelo de Círclo Vicioso – VCM - Ciclo

- Feedback + para (-) cresc pop, depleção de recursos e aumento de pobreza.
- fertilidade como ajuste de risco – filhos são seguro de vida (old-age security)
- Garrett Hardin's famous "tragedy of the commons"

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ESCALAS - teorias operam simultaneamente

- Global - difícil predizer – preocupação com consumo China/India
- Cornucopian – Dinamarca;
- Ecologia Politica – Haiti
- Borserup – developing worlds

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2. Teorias P - E

Teoria	Problema	Solução
Neo Mautusianismo	Crescimento populacional	Programas de controle populacional
Cornucopianismo	fracassos de mercado	corrigir os problemas de mercado
Ecologia política	desigualdades em diferentes escalas	Tratar estas desigualdades

- Poucos testes empíricos para serem consideradas robustas

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3. Revisão por Área

(A)

LUCC deforestation – muita literatura > cresc pop → deforest

- **Fertilidade** – produção familiar, segurança p idade (S America)
- Composição sex e idade – firewood, game e água
- Outro pulso: de subsistência para fazenda → orientado a mercado de grãos e gado (geração q traz capital e trabalho p investimentos)
- **Migração** - principal driver, leap-frog
- Sinergismo c outros fatores – demanda por terra , produtos florestais e agrícolas
- Fatores políticos e institucionais – investimentos gov
- Variáveis intervenientes

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3. Revisão por Área

(A)

LUCC deforestation – escala

Am Latina - (-) pop rural (++) desmat Amz Equatoriana

- BR Amz – fatores exógenos - soja, mecanização (-- pop)
- Depop rural → ++ desmat
- Importância de escada e efeitos locais

LUCC – onde tem H, tem efeito

-? Qual escala tempo e espaço pop interage c processos sociais, políticos e econômicos p produzir LUCC?

- - desafio - escala subnacional (meso) – cadeias causais entre escalas espaciais. →métodos vários necessarios

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3. Revisão por Área

(B) Degradação de Solo Agrícola ou melhora

- (++) Dens Pop em áreas de agr de subsistência
- Círculo vicioso: (+) pop pobre → degradação Pobreza -> alta fertilidade -> crescimento pop -> demanda por alimento-> escassez de recurso -> pobreza -> baixa fertilidade do solo -> diminuição produtividade → baixa preocupação com ambiente -> exploração a curto prazo (pouco acesso a tecnologias)
  - pobreza -> degradação do solo

- (ECONOMISTAS) – fertilidade → extensificação – abertura de novas áreas
  - 3 medidas de depleção de recursos locais foram signif. relacionadas com tamanho de família
  - Mas trabalhos ainda não são suficientes

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3. Revisão por Área

(B) Degradação de Solo Agrícola ou melhora

- Borserupianos: (+) dens → intensificação agr
- Aumento demanda alimento → (+) interações sociais e de mercado > agricultura intensifica > economias de escala impedem uma crise Maltusiana

- Bangladesh – efeito do mercado
- Não apenas pop mas outros fatores levam a degradação: institucionais, sociais, biofísicos
- (+) Pop pode ser negativo > demanda por terra, ou positivo > intensificação e tecnologia (REINOS ECONOMICOs e INSTITUCIONAIS)

- Mais estudos e dados para ampliar o debate.

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3. Revisão por Área

(C) Abstração e poluição de recursos hídricos

- Distr de pop H evita extremos de disponibilidade hídrica –
- Como pop (+), e agua é mesma -> (-) disponibilidade
- Efeitos de fertilidade e disponibilidade de água

- Pressao pela terra > stress por água e recursos > outmigracao da Bacia Pangani (Kilmanjaro) Tanz
- Ex da RMCampinas-SP → (+) pop (+) problemas de qualidade água (rapidez e baixa densidade de crescimento pop – infra sanitária não acompanha)
- Relação é complexa, mas tem q considerar outros fatores.... Tecnologia agric. e ind, tratamento efluentes, mecanismos institucionais, etc
- Uso comum e regulação – instituições
- Modelagem de bacia pop-desenvolvimento - ambiente

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3. Revisão por Área

(D) Ambientes costeiros e marinhos

- Muitas ocupações – pesquisars preocupadas com ambientes terrestres, (marinhos mais difíceis de identificar foot print)
- Pop é sempre o driver de problemas ambientais

- Kuna (caribe Panama) – perda de coral, (+) pop -> paredes de coral para ampliar terras das ilhas → erosão das encostas e aumento do nível do mar;
- Manguezais – produção camarão e peixe
- Esgoto não tratado e runoff agrícola
- Outros fatores: sensibilidade dos sist. a stress, institições locais e mercados globais (camarão p ex)

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3. Revisão por Área

(D) Ambientes costeiros e marinhos

- Gestão difícil > água (gov mais gerais) x terra (privado e gov locais)
- Imigração e Urbanização – apontados como problemas MAS deve-se inclui contexto social e econômico e as interações na mudança demográfica
- Exploração dos recursos sem critério
- Incorporação de outras teorias como capital social e incorporação migrante - para entender pressão da pop na degradação ambiental

- Na **migração** – qdo há Strong land tenure e capital social > pouco impacto ambiental (casamento com locais eh bom tb)
-

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3. Revisão por Área

(D) Ambientes costeiros e marinhos

- **urbanização** e **turismo –** mais preocupantes
- IMPORTANTE: não apenas tamanho ou densidade pop MAS tb tecnologia, coesão social, sistema de propriedade comum, incorporação de migrantes, contextos econômicos e ecológicos
- Produção e consumo de produtos do mar (food) – impactos do mercado global - carecem de estudo

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3. Revisão por Área

(D) Energia, poluição do ar e CC

- **Var** Pop não são irrelevantes para estudar os drivers demográficos de **consumo de energia**
- **Domicílio** como unidade de análise – respondeu por 41% do aumento do consumo de energia (e não pop – respondeu 18%)
- média de idade dos residentes é positiva relacionada com consumo per capta,
- Tamanho e localização do domicílios são negativamente relacionados.
- Uso de carros tb varia por características de domicilio

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3. Revisão por Área

(D) Energia, poluição do ar e CC

- **Poluição do ar**
- IPAT –
- Diferentes resultados f (poluente, local, escala, e tempo)
- Nível nacional - correlação positiva entre tamanho pop e emissão CO2.
- Condições climáticas e geográficas regionais, assim como níveis de renda e tecnologia são muito relevantes
- Ex> %migrante, composição etária, nível de urbanização são tão importantes qto tamanho pop para emissões.

- Importância da **heterogeneidade** etária nos domicílios para estudos de emissões

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4. Conclusões

- **População** – variável disponível (NÃO > valores, cultura, interações), projeções e quantitativa > modelos
- Pop > formam sociedades – não resumíveis à demanda por comida e materiais que impactam no ambiente.

- Sistemas acoplados H – E > impactos não são unidirecionais mas recíprocos. Ex: efeitos do E na mortalidade e morbidade, doenças,

- **Instituições** – fazem mediação do impacto das var de pop no uso de recursos, geração de resíduos e impactos ambientais.

- **Sustentabilidade** – conceito amplo que abriga pesquisas de P E >> incluir cultura, consumo, valores, instituições, sist. industriais e de alimentos alternativos de

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4. Conclusões

Desafio:

Pesquisadores de micro e meso escala entender como as mudanças em escala local e nacional se relacional com mudanças de escala global

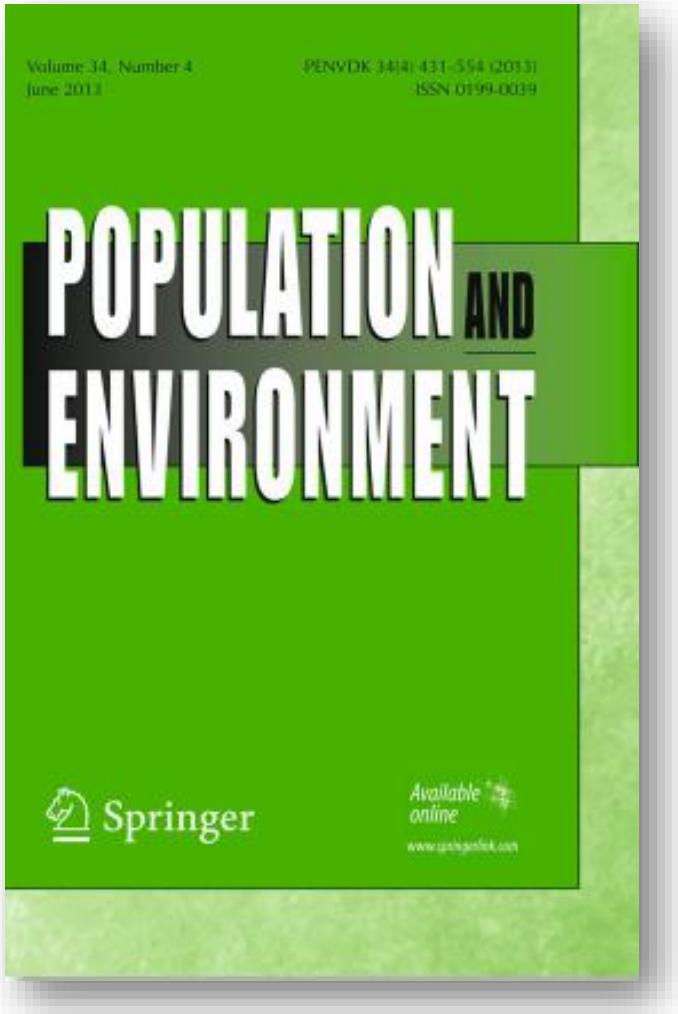
E

Como suas pesquisas podem informar politicas e programas nestas escalas menores (??) que irão atenuar impactos ambientais em todos os níveis.

P-E revisão de abordagens

Inter- and transdisciplinar approaches to population–environment research for sustainability aims: a review and appraisal

Diana Hummel,
Susana Adamo,
Alex de Sherbinin,
Laura Murphy,
Rimjhim Aggarwal,
Leo Zulu,
Jianguo Liu
&
Kyle Knight



Popul Environ (2013) 34:481-509
DOI 10.1007/s11111-012-0176-2

Approaches to population–environment research for sustainability aims (Hummel et al 2013)

Seminar: Population–Environment Research Network (PERN) February 2009

- Does the respective approach explicitly refer to a specific theory?
- Which specific research *questions* are addressable with the respective approach and by which *methods*?
- How are temporal, spatial, and social *scales* accounted for?
- At which level (micro-, meso-, macro- or multiple levels) is the analysis applied?

Theoretical and methodological approaches in P-E

Conventional **wisdom**: population growth in developing countries is regarded as a major cause for ecological degradation and natural resource depletion.

- Interactions: social, economic, institutional and technical developments, AND norms, power constellations, and patterns of needs
- Epistemological and ethical dimensions: uncertainties (about what the future will bring), ignorance (we don't know what we don't know) and contested knowledge (ambiguities and differing priorities among stakeholders).
- demands for more informed and timely political decision making are high

➔ How does current population–environment (P–E) research address these issues?

Theoretical and methodological approaches in P-E

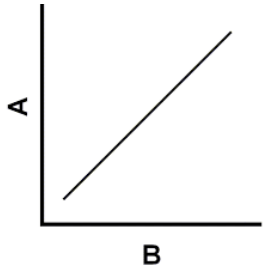
By virtue of its pluralistic nature, P–E analysis comprises a variety of theoretical perspective and methodological approaches.

Major theoretical approaches to paradigm shifts in the sustainability and human development debate:

4 Perspectives:

LINEAR, MULTIPLICATIVE, MEDIATING and **SYSTEM-THEORETHICAL**

Linear perspectives



Linear perspectives assume **a direct, causal and deterministic** relationship between population and environment.

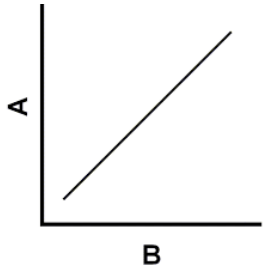
Malthusian and neo-Malthusian approaches.

Ecologists assuming **equilibrium dynamics**, they have featured theories and methods for assessing **human carrying capacity** and limits to **growth**

Classic approaches to Sustainable Development:

Population pressure, mainly **size** and **growth rate**, is a major and obvious culprit in visible **environmental degradation and impoverishment**.

Linear perspectives



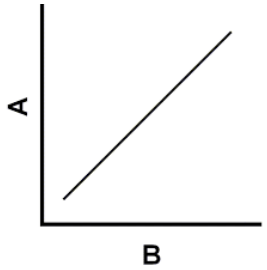
Population pressure, mainly **size** and **growth rate**, is a major and obvious culprit in visible **environmental degradation and impoverishment**.

Public and political debate emphasizing population growth as a (**if not the)** major cause of ecosystem degradation still prevails (Millennium Ecosystem Assessment 2005; The Royal Society 2010),

highlighting

the urgency of **reducing population growth and fertility rates in the South through population policies** (de Sherbinin 1995; see also Domingo 2008).

Linear perspectives



The general thrust of the P–E literature today, however, has evolved considerably from these simplistic debates.

Direct causal explanations are viewed as 'reductionist':

They oversimplify complex realities and are thus not very instructive.

BUT

Contributions from the natural sciences:

- regarding critical thresholds and limits of ecosystems or natural resources

do need to be taken into account in P–E studies

These natural-scientific analyses cannot be automatically dismissed or labeled 'neo-Malthusian' implying a linear and simplistic causality….

Multiplicative approaches: IPAT

In multiplicative approaches: **population is central**,

but *linked* to economic activity and technological factors

associated with sustainable development.

IPAT: $I = P * A * T$

Environmental impacts (I) are the product of population (P), affluence (A), and technology (T) (Ehrlich and Holdren 1971).

Models of 'sustainable development' focus on reducing population pressure on the environment through improved technologies.

BUT:

- it does not account for interactions *among* the terms
- *omits* explicit reference to important variables such as *institutions, culture, and social organization*, which are considered important variables

Multiplicative approaches: IPAT and STIRPAT

Refined IPAT - combined a **stochastic** form of the model with the ecological footprint concept, leading to the STIRPAT- approach (Dietz et al. 2007).

Stochastic Impacts by Regression on Population, Affluence, and Technology

STIRPAT

$$I_i = \propto P_i^{\beta} A_i^{\gamma} T_i^{\delta} \varepsilon_i$$

α - constant term; β,γ, δ - parameters to be estimated and ε is the error term.
A: represents affluence measured by GDP per capita,
P: Population is measured by the number of inhabitants and
T: Technology changes' proxies (e.g. industrial activity calculated by the share of the manufacturing industry in total GDP and energy efficiency measured by GDP per unit of energy use.

(1) allowing estimation of the net effect of anthropogenic drivers on the environment

(2) allowing for hypothesis testing, and

(3) incorporating other theoretically relevant variables including political, social, and cultural factors (Knight 2009).

It is thus

'*an analytic frame for disciplining conceptual models with empirical tests*'

Multiplicative approaches: STIRPAT

STIRPAT

Context - adding **theoretically relevant control variables** to the model

Demographic characteristics other than population size can be included such as age structure, household size, and urbanization

While most STIRPAT analyses have been applied at the country (macro-) level, the model is theoretically applicable **to any spatial scale**, such as cities

STIRPAT - it is not specific to any environmental threat, can accommodate **any impact** variable

The research program of STIRPAT is explicitly theory oriented and refers to Structural Human Ecology (SHE)

Multiplicative approaches: STIRPAT

Structural Human Ecology (SHE)

Emphasizes the **role of population** size, growth, density, and structure in explaining environmental impacts.

Biophysical factors such as **biogeography** and **climate** are also considered important contextual factors conditioning the social structural drivers of environmental impacts

STIRPAT

Can be considered an aggregated version of Coupled Human and Natural Systems (CHANS)

Can test hypotheses about population–environmental changes:

Ex: the proportion of elderly persons in a population is associated with greater total energy consumption.

York (2007): the proportion age 65 and over has a significant, positive effect on total energy consumption, controlling for total population, affluence, and urbanization.

Multiplicative approaches: STIRPAT

STIRPAT - multiplicative perspective reveals:

- To reduce impact on the environment → look beyond population to address rising affluence and technology (e.g. improved energy efficiency)
- **Weakness**:
  - focus on macro-level analysis
  - all variables must be reduced to the parameters - to be incorporated into a multiple regression equation
  - Factors that cannot easily be quantified, **like culture and institutions**, are necessarily omitted
  - water pollution and land cover change cannot be incorporated because of lack of adequate data

Although superior to simpler linear approaches,

STIRPAT is still reductionist, omitting a range of environmental issues, mediating variables, and contextual factors

Mediating perspectives: Boserup, Sustainable Livelihoods, and Political Ecology

Mediating perspectives :

- there is no direct, causal relation between Population and Environment
- Interrelated and '**mediating**' factors such as policy context, science and culture ***link*** population factors with environmental outcomes.

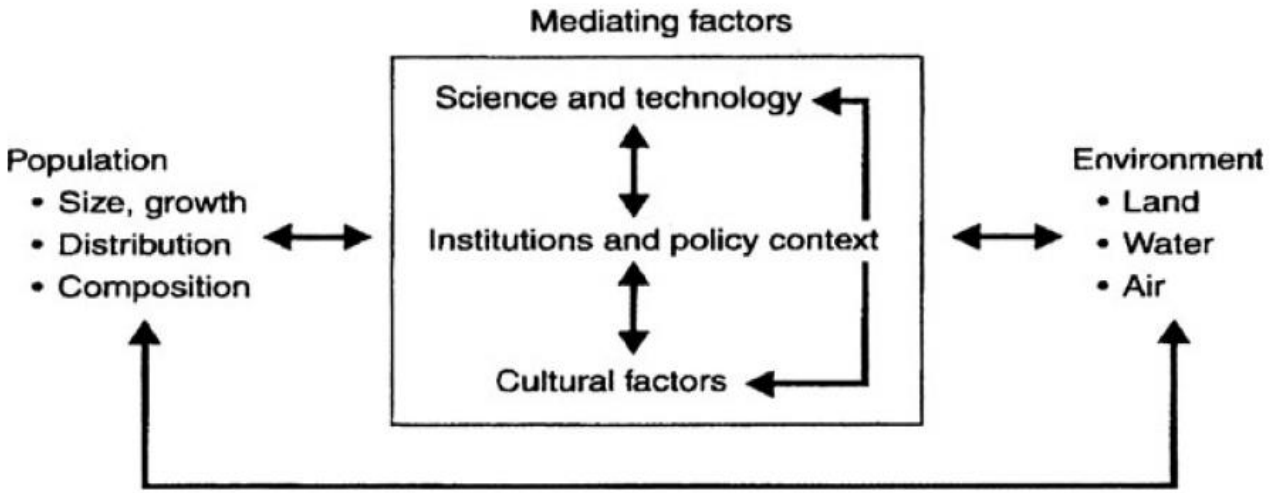


Fig. 1 Mediating variable approach. *Source*: De Souza et al. (2003: 14), Hunter (2000: 4)

Mediating perspectives: Boserup, Sustainable Livelihoods, and Political Ecology

Recent Empirical Studies:

- population dynamics have been unpacked and disaggregated
- Studies have analyzed specific population changes (e.g., in density, composition, numbers, sex/age structure, and life histories) and their impacts on specific environmental changes such as land degradation, deforestation, or climate change, etc.

Boserup (1965, 1981) and Simon (1986) emphasized the role of technology, institutions, market, and policy contexts in framing the population- environment nexus.

Mediating perspectives: Boserup, Sustainable Livelihoods, and Political Ecology

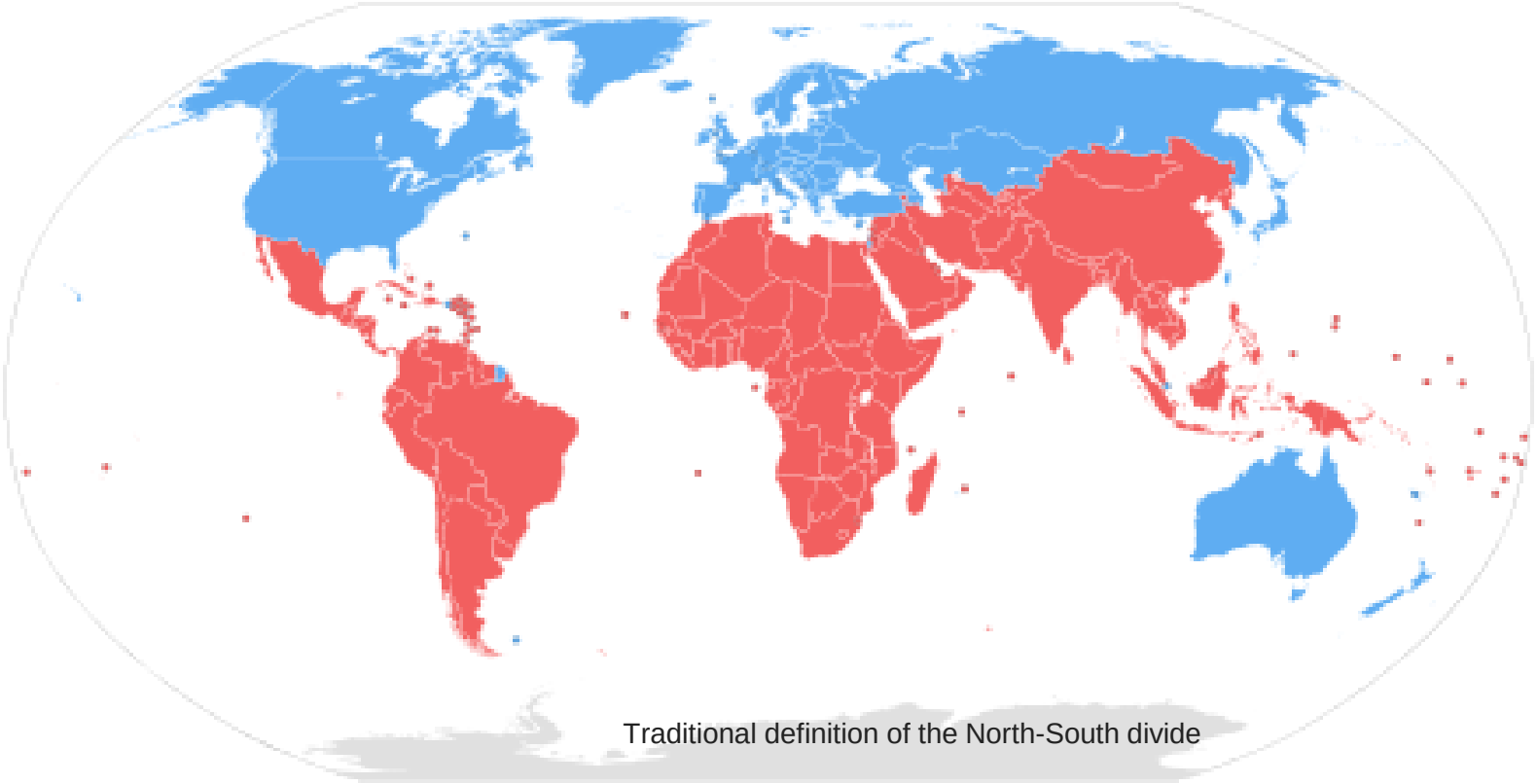
Mediating perspective emphasizes that P–E dynamics are dependent on **contextual** factors: macro-economic policies, globalization, resource exports, institutions governing resource access plus local or region-specific dynamics.

- These perspectives are close to the theory of social embeddedness (Granovetter 1985), a reminder that population–environment relationships do not happen in a vacuum (Adamo and Guzmán 2001)

Mediating perspectives: Boserup, Sustainable Livelihoods, and Political Ecology

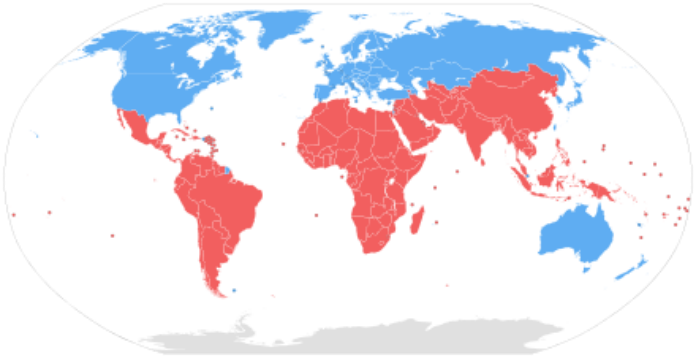
The ***development-dependency*** *approach* is characterized by a critique of the prevailing mode of development.

International economic and political power constellations → shape North–South dependent relationships → effects on population development and the environment.



Traditional definition of the North-South divide

Mediating perspectives: Boserup, Sustainable Livelihoods, and Political Ecology



Dependency theory, political economy, and other critical schools fed into critical **political ecology** approaches to understanding human–environment relationships from the ground up.

From farming systems research and work with rural communities - the **sustainable livelihoods** framework arises as one popular, practical approach.

These ***two post-development theories of population–environment interactions*** will be described:

Political Ecology & Sustainable livelihoods framework

Mediating perspectives: Political Ecology

Political ecology: a collection of theoretically related approaches that seek to make more explicit **the interacting political and ecological processes** that operate at **different geographic and temporal scales.**

- Their interactions *shape local environmental problems* and affect the options available **to local** decision makers to resolve these problems

- emphasizes historical and structural factors, incorporates spatial and temporal dimensions, and calls for different *levels and scales of analysis*

- focuses on ***the recursive relationship between society, population, and the environment,*** seeking to disentangle the ultimate, underlying causes of social-ecological problems such as the co-occurrence of poor people and environmental degradation

Mediating perspectives: Political Ecology

Political ecology: a collection of theoretically related approaches that seek to make more explicit **the interacting political and ecological processes** that operate at **different geographic and temporal scales.**

- Analysis focuses on ***mutually constitutive dynamics*** *of nature and society* from a critical and actor-oriented perspective.

- Common themes:
  - links between political marginalization and environmental degradation,
  - impacts of differential power on resources access,
  - gender dimensions of social-ecological problems,
  - a materialistic critique of capitalism and neoliberalism,
  - social justice turn and social movements

Mediating perspectives: Political Ecology

Political ecology

Classic example: Leach and Mearns' (1996) *The Lie of the Land*.

- Mixed natural and social science research methods to examine social, cultural, political, technological, demographic and economic factors in relation to observed landscape characteristics.

- Demonstrated that: population impacts were complex and context specific.

- Population growth was often only one of several other proximate causes shaping P–E problems.

Blamed such P–E orthodoxy for problem misdiagnosis and misguided 'one-size-fits-all' Malthusian policies when multi-faceted, context-sensitive interventions were called for.

Mediating perspectives: Political Ecology

Political ecology

Political ecologists - avoid the **Malthusian trap** by considering not only population growth, but also **spatial patterns, mobility, household composition and life trajectories**.

P–E interactions are contextualized in a set of social (including demographic), economic, and ecological causal and mediating factors operating in a particular (localized) area, and '***whose outcomes produce distinctive problems and suggests particular solutions'***

Some political ecologists even suggest that environmental problems in the developing South often are ***'less a problem of poor management, overpopulation, or ignorance, as of social action and political-economic constraints***' (Peet and Watts 1996).

Mediating perspectives: Political Ecology

Political ecology - a collection of holistically oriented, critically informed approaches with strength and weakness.

✓ Political ecological analysis draws on various disciplines and (potentially) achieves social-biophysical integration and transdisciplinary thinking.

x The diversity of objectives, epistemologies, and methodologies makes it difficult to find a coherent theoretical approach or common thread running across it.
x over-emphasis on either politics or ecology: *Local people are often portrayed as victims instead of agents.*

✓ Increasingly integrating qualitative/quantitative and social/natural science methods
x the approach has been generally qualitative, involving in-depth case studies and ethnographies. This is inconsistent with empirical hypotheses-testing and statistical generalizability to larger populations.

One solution would be more comparative and broader-scale studies that lead to 'theorizing-up from place-based studies'

Mediating perspectives: Political Ecology

Political ecology

*The specific **utility** of political ecology consists in providing a rich **understanding** of population–environment-development interactions in specific settings, characterized by contingent power relationships, local knowledge systems, and decision making by social actors.*

*Political ecology approaches **can explain the behaviors** of these actors—for example, local land managers, indigenous peoples, and power-brokers—within a specific agro-ecological setting, linked through markets and other institutions to (usually unfavorable) national and global policies.*

Mediating perspectives: Political Ecology

Political ecology

Jialiang Gao, www.peace-on-earth.org - Original Photograph

Mediating perspectives: Political Ecology

Political ecology

Jialiang Gao, www.peace-on-earth.org - Original Photograph

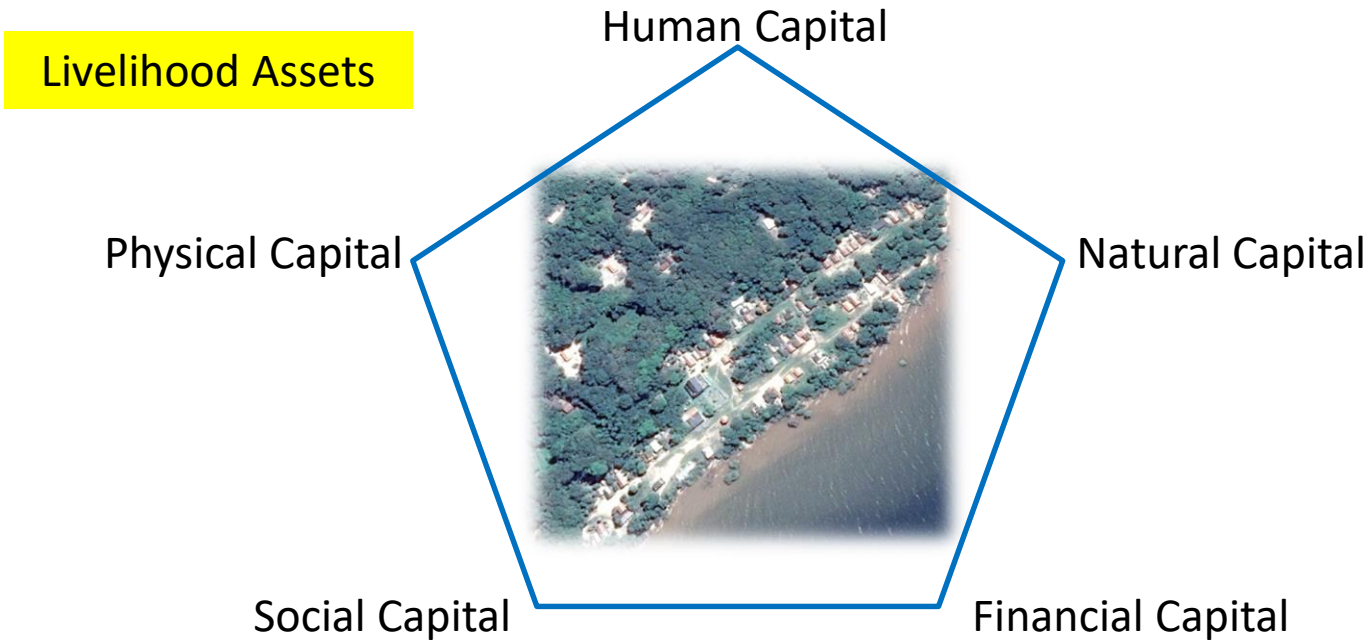
These terraced rice fields in Yunnan, China, evidence how the environment is shaped by and shapes economy and society.

Mediating perspectives: Sustainable Livelihoods

Sustainable Livelihoods framework (SL)

Taking a micro- and meso-level perspective, SL takes the **household** (within a small community, such as a village) as its core **analytical unit**.

It examines access to different **assets** which can be translated by the households and communities within specific vulnerability contexts and institutional settings into different **livelihood strategies**

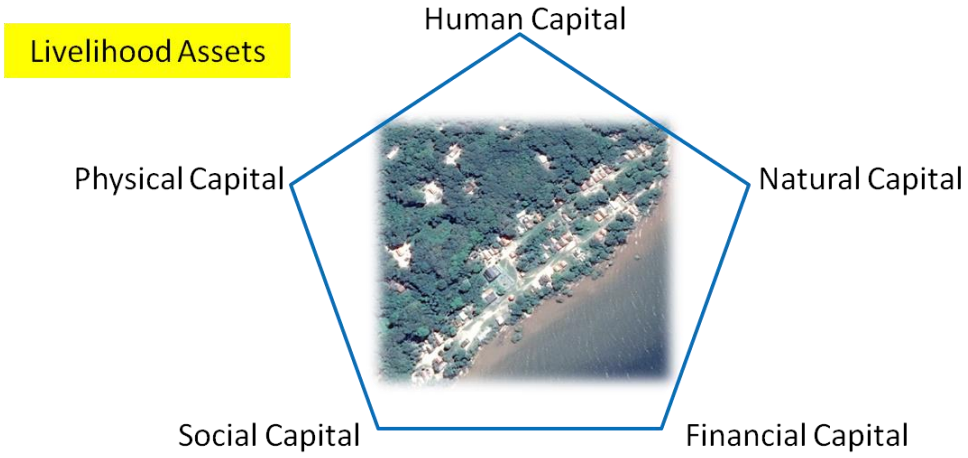


Mediating perspectives: Sustainable Livelihoods

Sustainable Livelihoods framework (SL)

Five forms of capital:

- **financial** (inflows of money, savings),
- **natural** (local natural resource stocks and flows),
- **physical** (tools, equipment, infrastructure, built environment),
- **human** (access to labor, health, skills, knowledge),
- **social** (networks of social support and relationships)

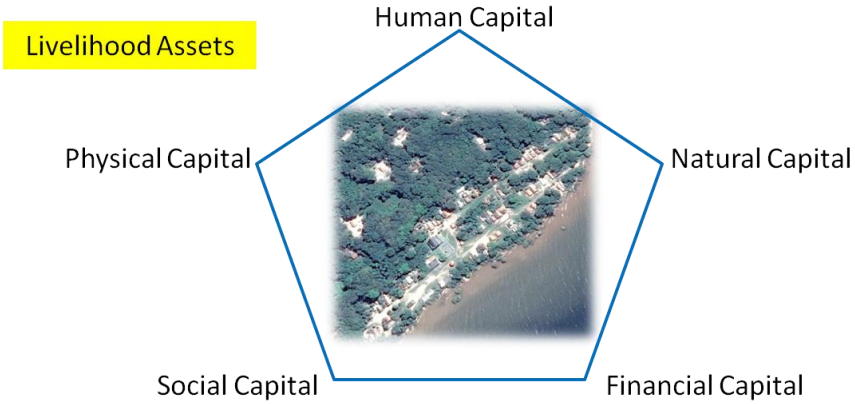


Mediating perspectives: Sustainable Livelihoods

Livelihoods : 'the capabilities, assets (including both material and social resources) and activities required for a means of living'

Sustainable: when it can cope with and recover from **stresses and shocks** and maintain or enhance its capabilities and assets both now and in the future, while **not undermining the natural resource base**'

We need to understand and act upon the asset endowments and access limitations of **disadvantaged populations**, the ***risks*** they face, and the ***institutional*** environment that either facilitates or blocks them in strategies to build pathways out of poverty;



Livelihood Vulnerability

Livelihood strategies

Livelihood Outcomes

Mediating perspectives: Sustainable Livelihoods

Sustainable Livelihoods framework (SL)

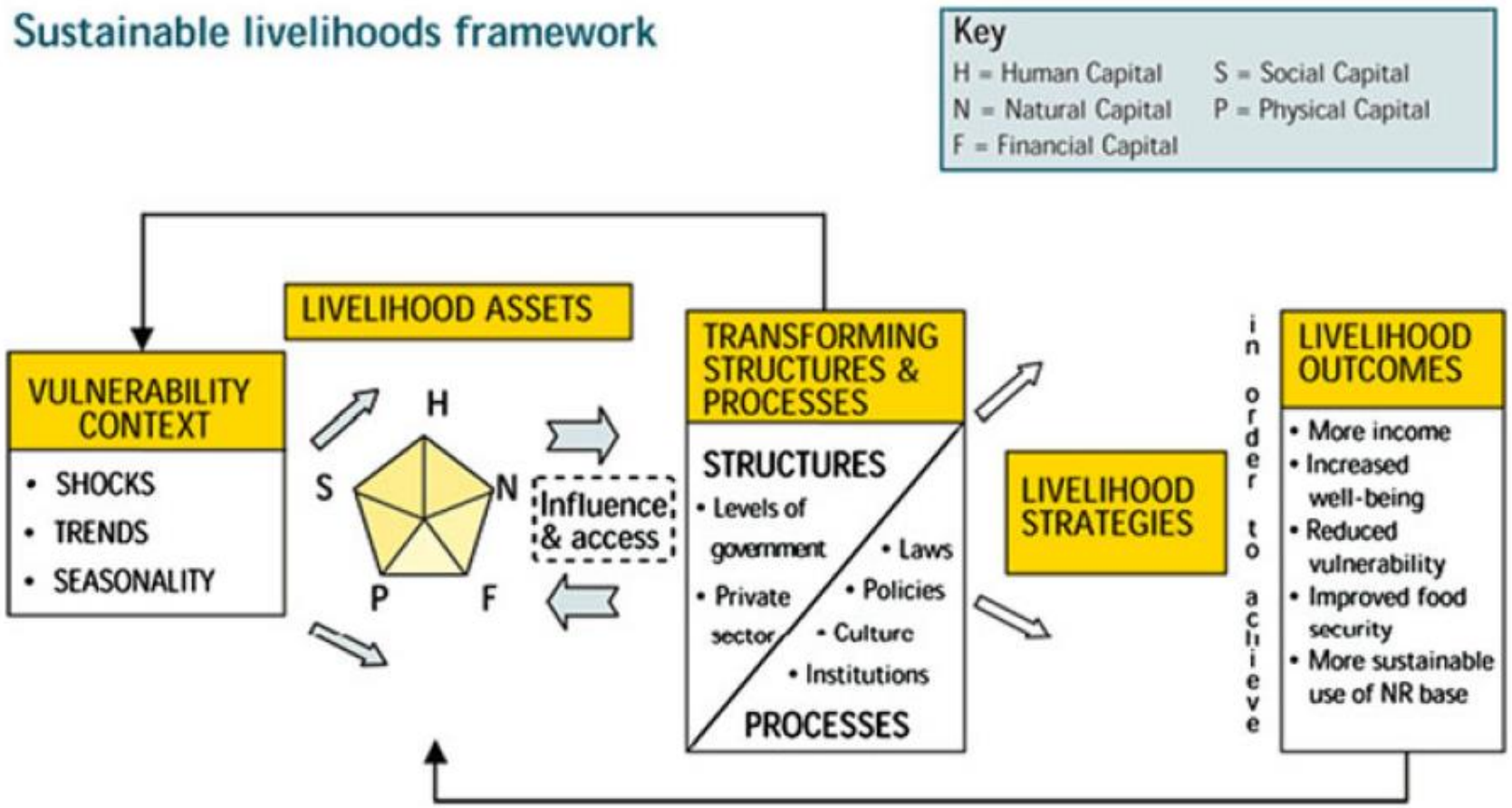


Fig. 2 Sustainable livelihoods framework. *Source*: www.livelihoodscsr.org.uk

Mediating perspectives: Sustainable Livelihoods

Sustainable Livelihoods framework (SL)

It acknowledges **power-based relations**, differential **access** to assets and the larger 'vulnerability context' and institutional settings.

It accounts for alternative value systems and ways of knowing.

The normative goal is improved livelihood security.

The SL framework places people at the *center* of a **web of interrelated influences** that affect how these people create a livelihood for themselves and their households.

The most critical element in influencing livelihoods is the **assets** the households have access to.

Households - multiple resource extraction activities & Several demographic variables at the household level

Vulnerability context and the structures operating at the meso- and macro-level - → households develop specific livelihood strategies

Mediating perspectives: Sustainable Livelihoods

Sustainable Livelihoods framework (SL)

Households - multiple resource extraction activities & Several demographic variables at the household level

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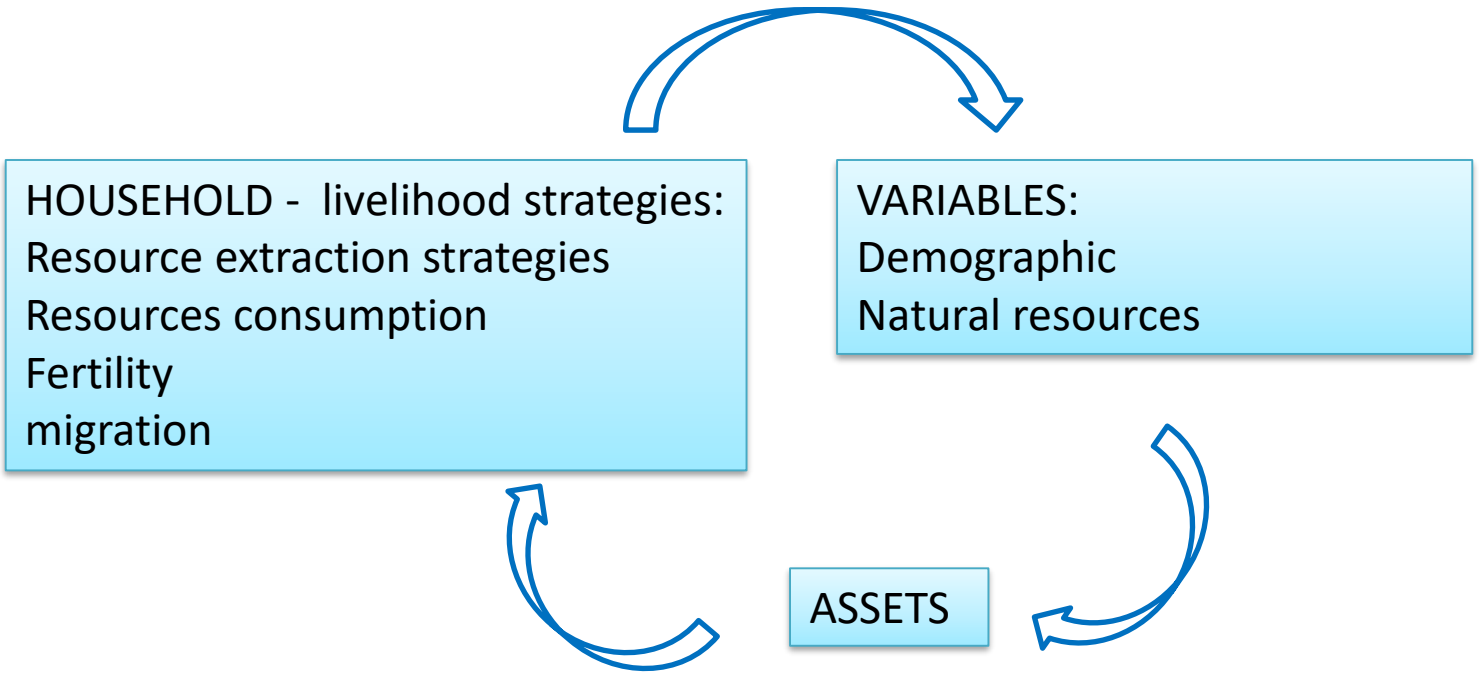


Mediating perspectives: Sustainable Livelihoods

Sustainable Livelihoods framework (SL)

⇧ Mortality (HIV/AIDS) → ⇩ pressure on resources (people-to-land ratio)

SQN !

⇧ adult mortality rates → resource degradation (explotation of natural resources)

Micro-demographic factors and processes x Local Ecosystem (negletcted by Mathusians)

diversity at micro-level

>> diversity of Livelihood patterns >> intervention points and policy >>

poverty and environmental degradation in developing societies

E.G. >> greater tenure security, opportunities for girls' education, and local health infrastructure may be more effective ways to achieve desired demographic and natural resource outcomes than focusing on family planning efforts only

Mediating perspectives: Sustainable Livelihoods

Sustainable Livelihoods framework (SL)

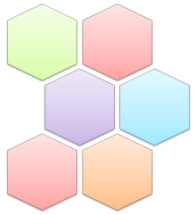
- ✓ it identifies assets, ways of living, and pathways out of poverty.
- ❑ it does not engage with the structural causes of vulnerability or the larger processes that lead to poverty

- ✓ Research based on the SL framework acknowledges the meso- and macro-level factors—such as poor markets, failed government institutions, and regressive social policies
- ❑ But…. views them as exogenous factors affecting livelihood strategies and outcomes at the micro-level

- ❖ key challenges of the SL framework is thus to substantively interact and processes at **the household level to the community, regional, and global levels**.

These multilevel and cross-scale interactions are more captured by system-theoretical approaches

System-theoretical approaches: CHANS, PEDA, and Supply Systems



Generally,

system-theoretical approaches are dedicated to the analysis of either coupled

'human–environment systems' (e.g., Turner et al. 2003),

'socio-ecological systems' (e.g., Gallopı´n et al. 2001) or

'social-ecological systems' (e.g., Berkes et al. 2003; Gunderson and Holling 2002; Folke 2006; Ostrom 2007).

- account for dynamism, adaptive agents, and co-evolutionary processes
- 'dynamic systems'

- A common feature of system-theoretical approaches in P–E research is their view of

environment and population as interacting systems

and a focus on **the interdependence of environmental and social changes.**

System-theoretical approaches: CHANS

***CHANS*: Coupled Human and Natural Systems**

- seeks to provide a comprehensive framework for analyzing nature–society interactions

- Coupled human and natural systems are those in which **people** (not just 'population') interact with **natural components**:

social-ecological systems, human–environment systems,
population–environment systems,
ecological–economic systems

- Particular characteristic: **complexity** → characterized by nonlinear relationships, feedback loops, time lags, legacy effects, thresholds, heterogeneity, and surprises

- aims to reveal the underlying rules and emergent properties of thee systems, and the **patterns and processes that link human and natural systems**.

- Emphasizes the potentially **unpredictable** effects of humans, their organizations and practices on the environment, as well as the effects of environmental changes on human populations, institutions, and behaviors.

→ it promotes the integration of agency and multi-scale interaction

System-theoretical approaches: CHANS

***CHANS*: Coupled Human and Natural Systems**

Interactions (China):

- PANDAS Habitat, - largest homes + animals and plants reserve
- local people – 4500 residents, 1200 households + activities (farming, fuelwood, tourism)
- and government policies: Natural Forest Conservation Program

Since the reserve's establishment in 1975:

- local human population size has increased by over 70%
- the number of households has more than doubled.

→ quality habitat for the panda was dramatically reduced and fragmented

Since 2000 - Natural Forest Conservation Program

- subsidies for local residents to monitor forests from illegal harvesting
- Grain-to-Green Program offers farmers grain and cash to return their cropland on steep slopes to forests

System-theoretical approaches: CHANS

***CHANS*: Coupled Human and Natural Systems**

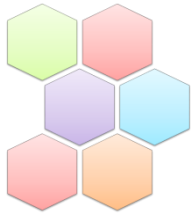
Interactions (China):

As result,

the panda habitat has begun to recover

- Using agent-based models and households-based landscape models, many complex attributes of CHANS were simulated:
  - feedbacks among households and forest dynamics,
  - legacy effects,
  - surprises,
  - nonlinear relations,
  - and time lags (e.g., population changes had a longer time lag than changes in household numbers in terms of their impacts on panda habitat

System-theoretical approaches: CHANS



***CHANS*: Coupled Human and Natural Systems**

- suggests to conduct studies at multiple organizational, spatial and temporal scales because there are not only differences between scales, but also different **interactions** among scales
- **emergent** properties of complex systems.
- By modeling complex systems, CHANS must balance the need for **realism** and **precision** with the need for **generality**.

- Major **challenge**: working on better linking the interdisciplinary CHANS framework to stakeholder needs and perceptions and engaging societal actors and practitioners in ongoing research, particularly in **terms of problem formulation and identification of** key processes and relationships

- Scientific research (complex systems) x need for more timely policy action
- 'dynamic sustainabilities' approach could complement the analytical orientation of CHANS.

System-theoretical approaches: (PDE) Model

Population-Development-Environment (PDE) Model

the 'PDE-model' **addresses**

long-term relationships among population, development and the environment and aims to inform policies.

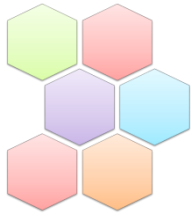
- The **goal**

is to understand the most **important factors** that are likely to shape the population–environment nexus in a chosen region.

PEDA (Agriculture – Africa): links population parameters (e.g., sex/age structure, migration) to other non-demographic socio-economic variables, such as education and gender-specific labor force.

All of these in turn are linked to issues such as land degradation, food production and distribution.

System-theoretical approaches: (PDE) Model



Population-Development-Environment (PDE) Model

Dynamic models allowed - to combine multidisciplinary qualitative data and analyses (ethnographic, historical, anthropological studies) and interdisciplinary quantitative modeling at a meso-scale (national or sub-national).

- PDE/PEDA models consider changes in the population, changes in relevant parts of the natural environment, and as well as feedback loops in both directions.

- identify specific **key mechanisms** underlying crisis-prone developments

System-theoretical approaches: (PDE) Model

Population-Development-Environment (PDE) Model

PEDA model is dedicated to the Human Development approach; is inspired by the 'vicious circle' model (VCM), which hypothesizes that:

- a number of positive feedback loops contribute to a downward spiral of population growth, food insecurity and environmental degradation.

In contrast to a Malthusian macroeconomic reasoning, however, the vicious circle model focuses **on micro-economic effects at the household and community level.**

It provides a framework for examining **fertility, poverty, low female status, and environmental degradation.**

System-theoretical approaches: (PDE) Model

Population-Development-Environment (PDE) Model

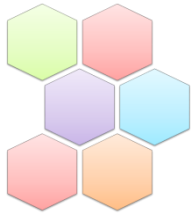
- ✓ PEDA - developed by the United Nations Economic Commission for Africa (ECA) as an interactive **computer simulation model** and is explicitly used as an advocacy tool to illustrate the **likely impact of alternative policies**.

- ✓ For P–E research: PDE and PEDA models utility is that they address certain neglected demographic factors such as **age structure and education levels**.

- ✓ PEDA is clearly policy-oriented and seeks to help political decision maker,
  - ❑ However has been **limited to rural societies in developing countries**.
  - ❑ Economic reasoning of the model (based on the vicious circle hypothesis) restricts it to the **household level**

- ❖ it could be relevant at the macro-level even if some of the assumptions remain unconfirmed and controversial

Social-ecological approach: Interactions of population dynamics and *supply systems*



The social-ecological approach relates demographic changes to the interactions between ‘nature’ and ‘society’ and follows a strong **theoretical** orientation.

Population dynamics are viewed as **indicating transformations of societal relations to nature**, that is, the relational network formed by individuals, societies, and nature in interaction

Demographic changes are systematically related to the issue of **provisioning** the society with environmental goods, resources, and services.

Assumption that

the **number of people** in a given society implies **regulatory requirements** for supply systems resulting in social-ecological problems.

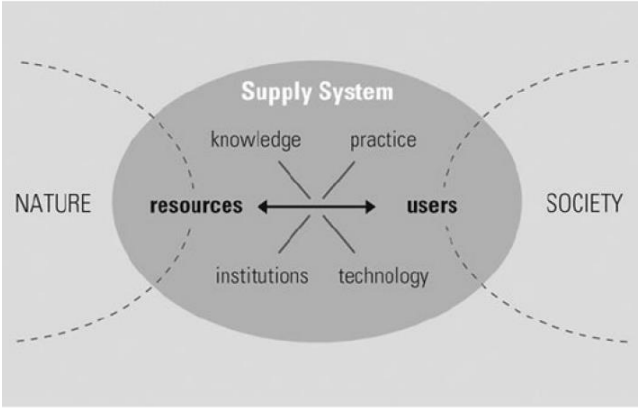
Social-ecological approach: Interactions of population dynamics and *supply systems*

However…

Central normative **: it is not population dynamics and absolute population numbers that generate these problems**, but rather the <u>adaptive capacity of provisioning structures to cope with demographic changes.</u>

→ a transdisciplinary model of supply systems has been developed for analyzing the interactions among population, nature, and society

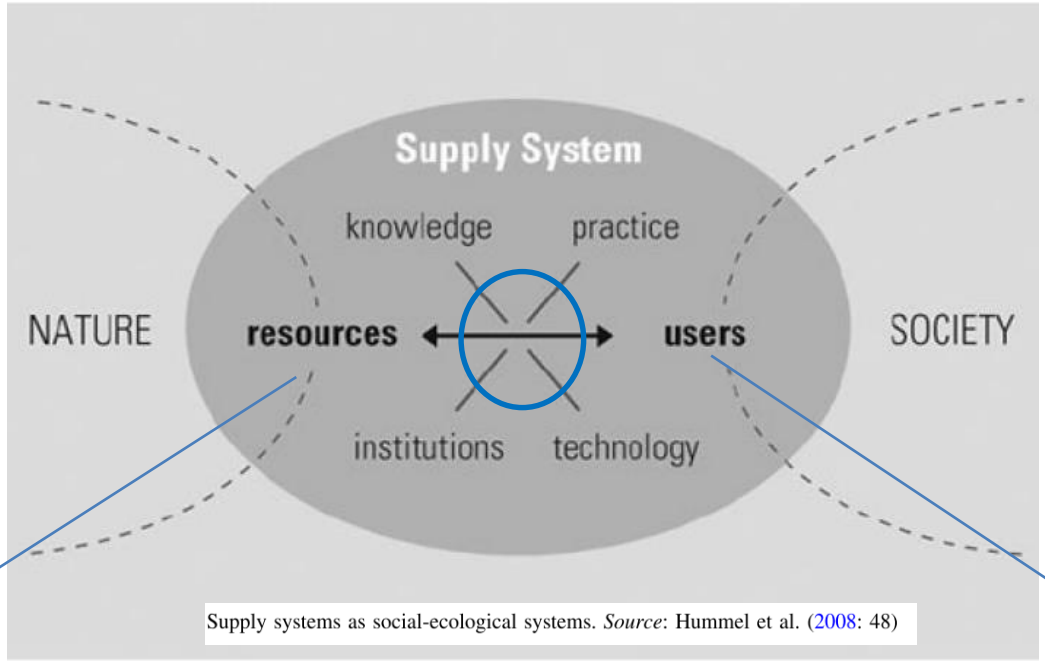
- Based on ecosystems – connections between natural resources and their utilization
- Supply systems – bio-physical and material-energy dimensions & cultural aspects



Supply systems as social-ecological systems. *Source*: Hummel et al. (2008: 48)

Social-ecological approach: Interactions of population dynamics and supply systems

Supply systems are conceptualized as social-ecological systems (SES)



Supply systems as social-ecological systems. *Source*: Hummel et al. (2008: 48)

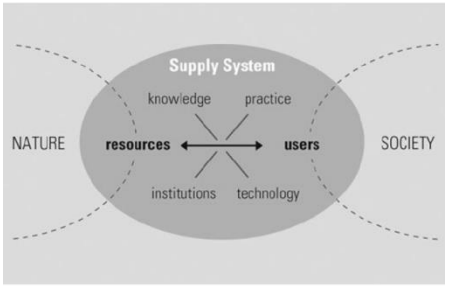
Material, organic and spatial structures (food, water, energy)

Resource utilization is determined by knowledge, practices, institutions, and technology.

Actors (producers and consumers)
not pop, but dependente on supply system

Social-ecological approach: Interactions of population dynamics and supply systems

Supply systems as social-ecological systems (SES)



- These dimensions specify how resources are made available and determine the vulnerability, adaptability, scope and options of provisioning regulations.

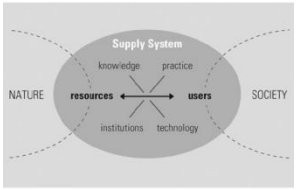
Use:

model was used to identify the major challenges for the **adaptive capacity of supply systems in the face of demographic changes,**

- urbanization processes and food supply systems in Ghana
- shrinking populations and water supply in Germany
- migration, population distribution, and integrated water resource management in Namibia
- population growth and water conflicts in the Middle East… >

Social-ecological approach: Interactions of population dynamics and supply systems

Supply systems as social-ecological systems (SES)



e.g.

The study on population growth and water conflicts in the Middle East (Hummel 2008) >> allowed to address the temporal and spatial heterogeneity of demographic changes and supply systems:

The model was used to identify the major **challenges for the adaptive capacity** of supply systems in the face of demographic changes, for example, the spatiotemporal 'misfit' between:

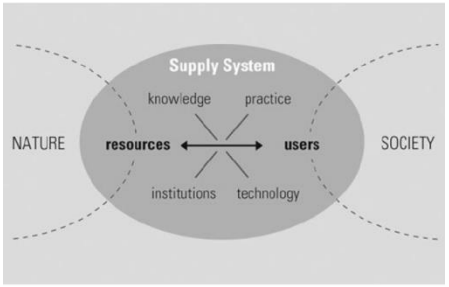
demographic dynamics (e.g., short-term migration and resulting changes in demands)

and

provisioning structures (e.g., persistent, centralized water infrastructure)

Social-ecological approach: Interactions of population dynamics and supply systems

Supply systems as social-ecological systems (SES)



✓ permits focusing the analysis of the **interactions** of population and environmental changes on the issue of **provisioning** and facilitates the analysis of societal **utilization** of ecosystems and resources.

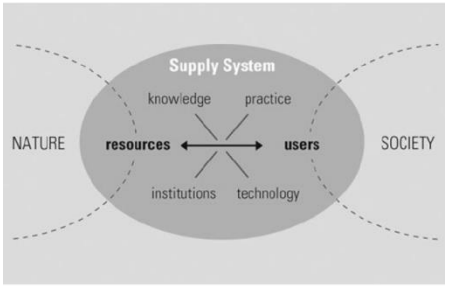
✓ the problem focuses on the **preconditions** that need to be met in order to **design adaptive and sustainable supply systems.**

- The model is further **actor-oriented**, since it conceptualizes any population under study as one category among other societal users of natural resources.

- **Depending on the research question**, different specifications (individuals, households, communities, consumer sectors, urban/rural, etc.) can be made.

Social-ecological approach: Interactions of population dynamics and supply systems

Supply systems as social-ecological systems (SES)



❑ However, the **generalizability** of the empirical studies is limited.

- The conceptual model is restricted to portraying overall factors that are relevant to interactions between population dynamics and supply systems, **but specific factors** must be identified in each case

For the identification of **pathways to more sustainable provisioning** structures and

corresponding governance initiatives,

a mixed methodology of surveys, participatory research and more formalized modeling

would be required

Discussion

Approaches

- **range** from revealing neo-Malthusian limits and the 'impacts' of demographic changes to complexity science and adaptive systems.

- **Methodological approaches range** from linear regression to participatory case studies from ethnographic critiques (political ecology) to simulations,

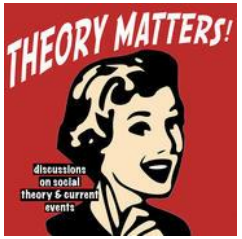
and from

- historical case studies to scenarios of interactive human/ecological systems (e.g., CHANS, PEDA).

- Some approaches (e.g., political ecology or supply systems) are **useful for explaining processes** in a specific place, but provide little generalizability to other settings.

- In contrast, others offer generalizability and useful projections about the effects of a specific policy (e.g., STIRPAT), **but are relatively removed from the lived experiences of people**

Discussion



A) Theory Matters

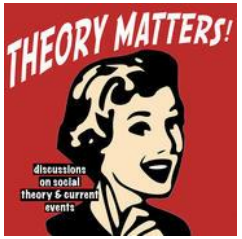
- Some approaches to P–E relationships, such as STIRPAT, PEDA, and SL, are **strongly linked** to a specific, identifiable conceptual framework and development or normative orientation

- other approaches such as **political ecology, CHANS, and supply system**s refer to a broad, loosely affiliated school of thought **with less defined parameters** (such as the level of analysis) or key variables (such as demographic indicators)

- In each of these approaches, however, the role of scientific theories, critical social theory, and normative approaches to development and poverty alleviation have a **role in guiding the variables, shaping the scale (and interactions between scales), identifying relevant stakeholders or actors, and thinking about how to link research to action.**

- The 'Sustainable Development' paradigm of the 1980s is allied with linear and multiplicative perspectives and mediating perspectives → **a focus on administrative units (countries, urban areas, variables such as markets and prices) and formal policies.**

Discussion



A) Theory Matters

STIRPAT, linked to 'mainstream sustainable development', is grounded in a classical division between science (an objective form of knowledge) and society (policy acting on behalf of the people).

It aims at providing preferably objective and robust knowledge which can then rationally inform policy.

Political ecology professes a normative orientation toward social justice and acknowledges agency, power relations, and exclusion—with an eye toward social change.

The **supply systems approach** emphasizes the normative goal of sustainable provisioning structures serving human populations, recognizing that needs can vary and require public debate

Thus, diverse theories around P–E lead to different problem depictions, research questions, conclusions, and notions of policy relevance.

There is no blueprint approach that works in all settings.

Discussion

B) Complexity

- There is a strong consensus in P–E analysis that:

population dynamics affect social, cultural, political, economic and ecological development,

with demographic processes in turn being influenced by social, cultural, economic and ecological conditions,

→ that is**, recursive causal relations** are at work.

- There are critical **temporal and spatial dimensions**, that is, variations in time and space of the elements and interactions, which introduce aspects of historical processes, context, geographic and temporal scale, and hierarchy

→ Models to map connections in this nonlinear, interdependent network of causality and co-evolutionary processes.

Discussion

B) Complexity

- The conceptual approaches are applicable to different spatial scales:

STIRPAT is usually applied at the macro-scale, while

SL usually refers to the micro-scale and the

Supply systems approach to the meso-scale.

It is important to recognize the difference that scale makes and to look at **cross-scale** interactions.

Key variables and their **interactions** must be identified.

Thereby different theories lend themselves to identifying different key variables and paths of interaction.

An integrated analysis of population, environment and sustainability **needs to reduce the complexity in the real world**—in a way that clearly represents the significant interactions among social and ecological processes and their outcomes

Discussion

B) Complexity

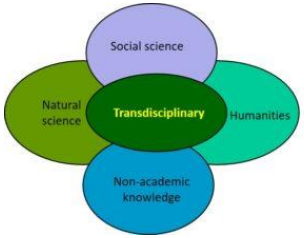
An integrated analysis of population, environment and sustainability needs to reduce the complexity in the real world—in a way that clearly represents the significant interactions among social and ecological processes and their outcomes.

Elinor Ostrom (2007, 2009) has presented a general framework for analyzing the sustainability of social-ecological systems.

Population growth or density are not foregrounded as key variables, but are part of the social, economic and political setting (and indirectly as the number of resource users).

This framework could be helpful for linking across different theories discussed here to provide a framework for comparative studies.

Discussion



C) New forms of knowledge production: toward trans-disciplinary approaches

Research that transcends the boundaries of natural-scientific and social-scientific disciplines is reflected in calls for 'interdisciplinarity'.

Research is also needed that includes the **values and historical knowledge** of **societal actors** as constitutive elements of the research process—reflected in the notion of transdisciplinarity.

Transdisciplinarity calls for viewing research as a **mutual learning process** involving both science and society. It is not the exclusive domain of scientific experts who translate their findings to a lay public or policy makers.

Some approaches reviewed here—political ecology, livelihoods, supply systems and dynamic systems—are working in this direction. They **explicitly incorporate non-scientific knowledge**.

… P–E studies could learn from the growing body of methodologies developed in sustainability sciences

Conclusion

Choice of a P–E model depend on:

a) the objective of study participants—researchers and societal stakeholders,

b) how the problem at hand demands attention to scale and interactions and a wide range of social, demographic and ecological dynamics, and

c) the need to communicate potentially complex system patterns to policy makers or societal stakeholders seeking simpler, identifiable points of intervention.

Thus, a combination of approaches and methods (e.g., the quantitative and more qualitative methods) could be productive

Conclusion

Future research:

1) more **long-term studies** of human–environment processes are needed, since P–E processes take place over longer periods of time.

2) more **comparative studies**, operating at different temporal, spatial, and social scales. A common framework can help us conduct comparable studies. This could include meta analysis of the existing case studies to distill the key multi-level processes and cross-scale interactions.

3) seek to offer lessons to policy makers and practitioners that **go beyond ‘one-size-fits-all’ blueprints solutions.**

Instead, we should expect more **nuanced and context specific, yet pragmatic interventions** that help us understand and address significant and diverse population–environment problems the world faces

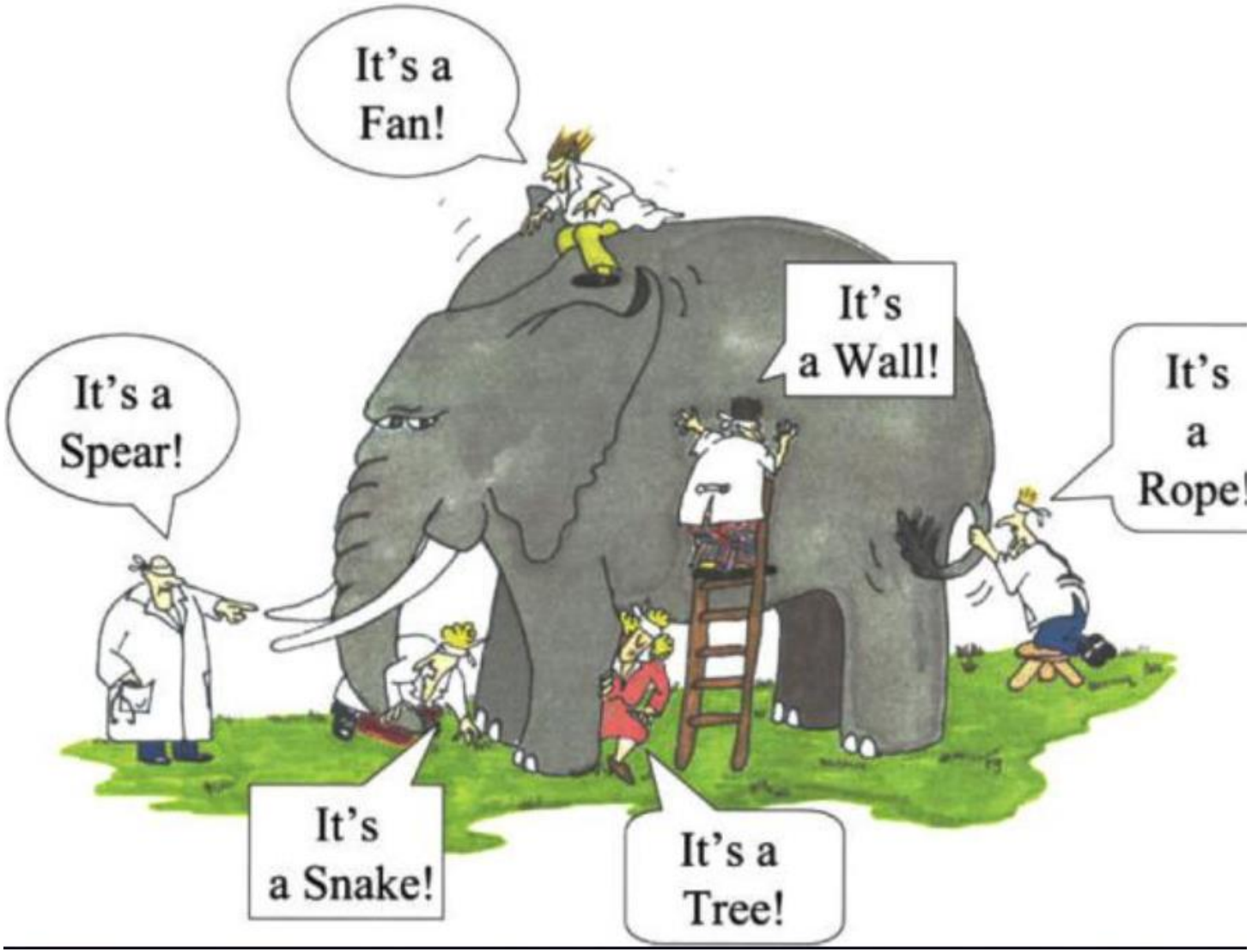
População e Ambiente

- PE analysis as a “chair with four legs” (page 5): population dynamics, environmental dynamics, and the influences of each on the other.

- P-E research remains an elephant described by a blind committee—but it is a powerful, complex beast that science and policy would be foolish to neglect or ignore (Frederick A.B. Meyerson)

https://www.jstor.org/stable/i356664

População e Ambiente



http://www.padaseva.in/2019/12/the-six-blind-men-elephant_18.html