

Ecosystem Services and Payments for Ecosystem Services

Michel Masozera, Ph.D.



Background

- **Since the Brundtland Report (1987) and the Rio 1992 Earth Summit, tropical conservation has gradually headed in a more people-oriented direction**
- **Conservation would become sustainable only if poverty was alleviated**
- **Integrated Conservation and Development (ICDPs) and Sustainable Forest Management emerged simultaneously to increase local incomes and conserve environment**
- **Neither approach has achieved major shifts in tropical land-use trends or silvicultural practices**
- **Much debate around the need for new conservation paradigms has emerged (the concept of ecosystem services/payment for environmental services)**

A few definitions

Ecosystem

- A dynamic complex of plant, animal, and micro-organism communities and the non-living environment interacting as a functional unit



Biodiversity

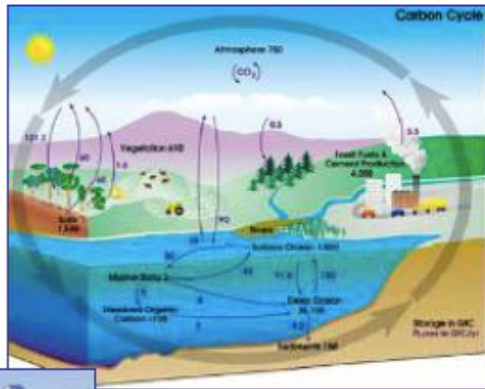
- The variability among living organisms
 - Within species & populations
 - Between species
 - Between ecosystems



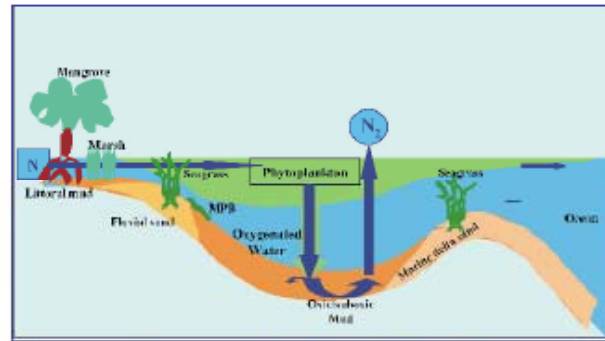
Ecosystem services

- The benefits people obtain from ecosystems
- The “services of nature”





Flood Attenuation/
Storm Surge Protection



Biogeochemical Cycling

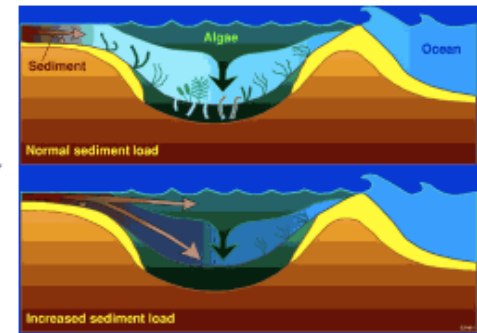


Recreation / Aesthetic

Atmospheric and Climate
Regulation



Ecosystem Services



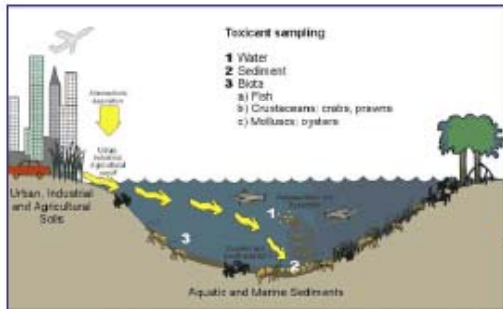
Soil and Sediment Regulation



Food and Fiber



Water Quality and Supply



Waste Regulation



Habitat/Fisheries



Pest and Disease
Regulation

ECOSYSTEM SERVICES

Supporting

- NUTRIENT CYCLING
- SOIL FORMATION
- PRIMARY PRODUCTION
- ...

Provisioning

- FOOD
- FRESHWATER
- WOOD AND FIBER
- FUEL
- ...

Regulating

- CLIMATE REGULATION
- FLOOD REGULATION
- DISEASE REGULATION
- WATER PURIFICATION
- ...

Cultural

- AESTHETIC
- SPIRITUAL
- EDUCATIONAL
- RECREATIONAL
- ...

Provisioning services: Goods produced or provided by ecosystems



Regulating services: Benefits obtained from control of natural processes by ecosystems

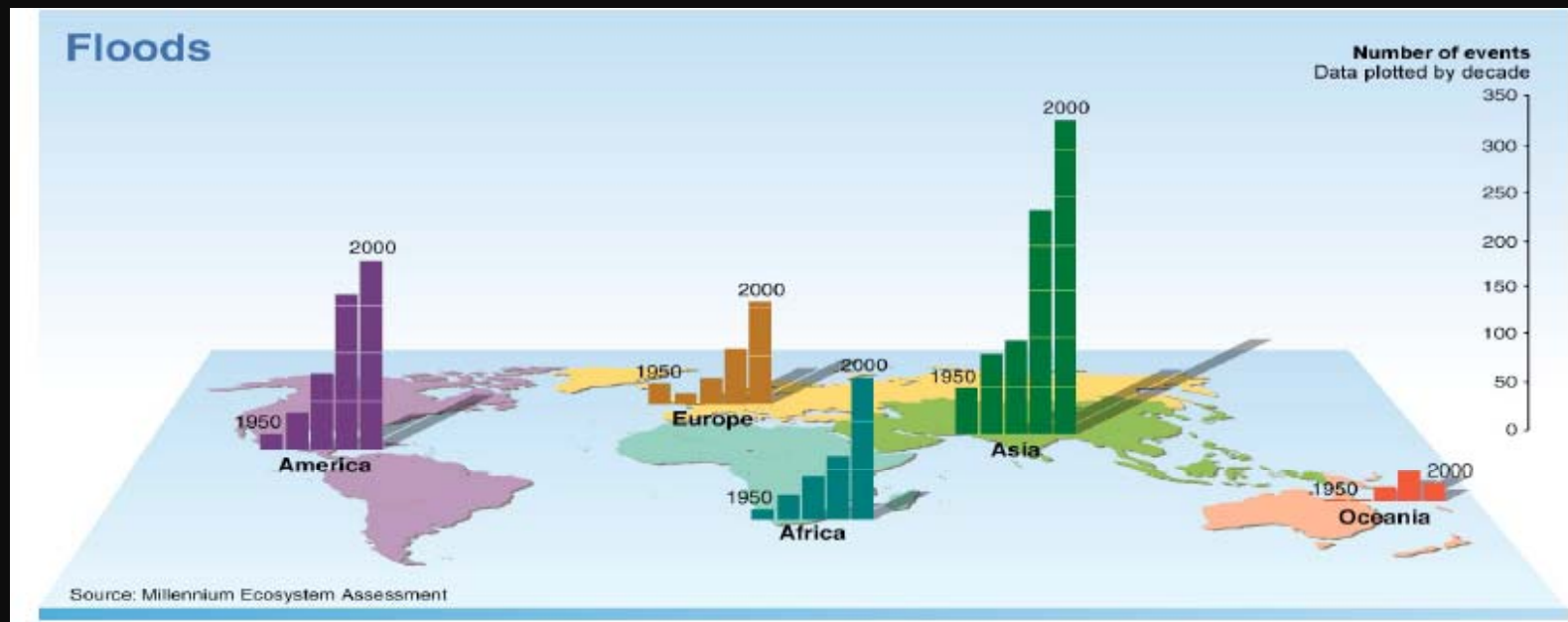


Cultural services: Non-material benefits obtained from ecosystems



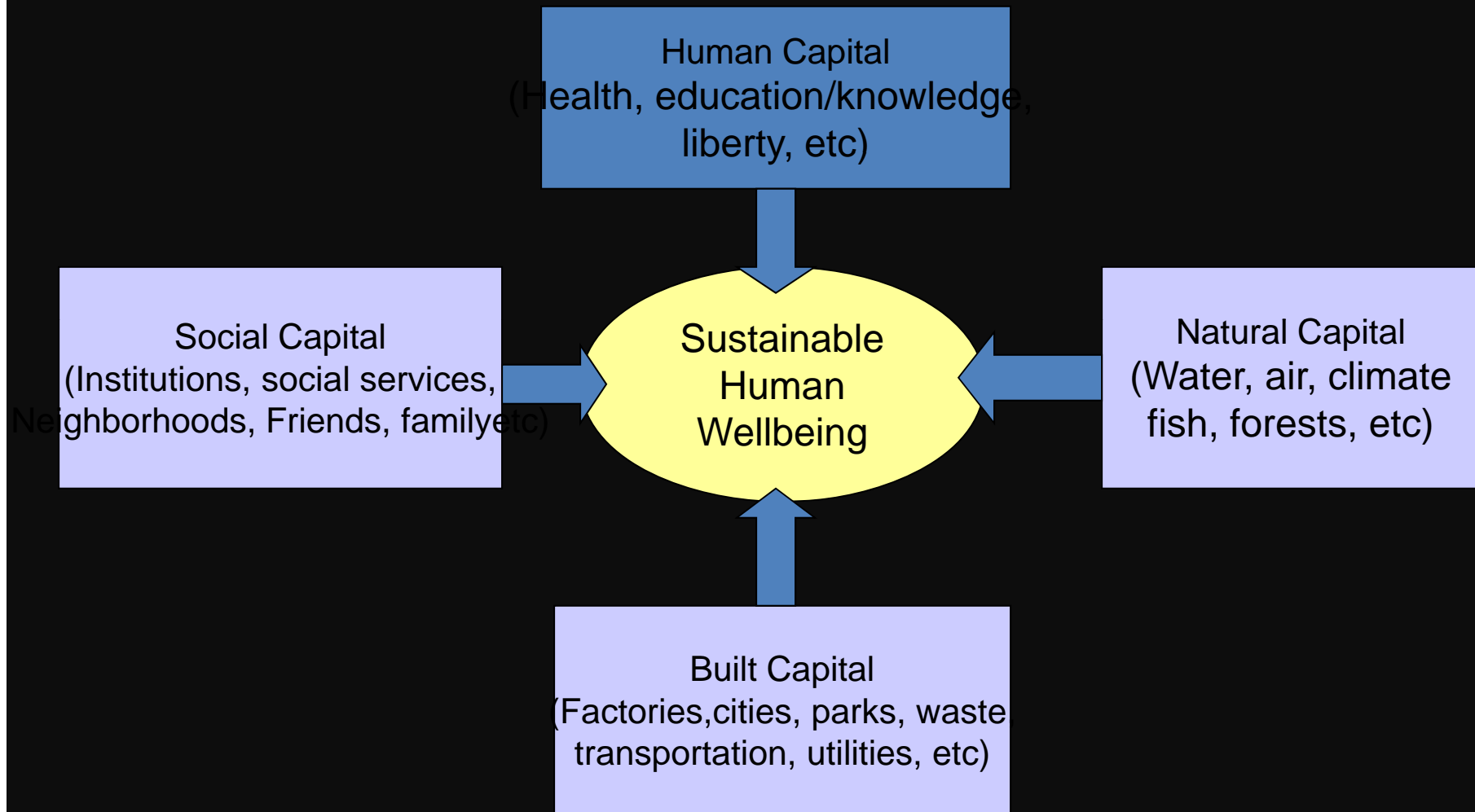
Why the Recent Surge in Interest in ES and PES?

- Growing numbers of natural calamities that burden society with great costs in terms of lives and money
- The financial consequences of floods, fires, droughts, landslides and extreme storms are bringing into focus the costs of environmental degradation



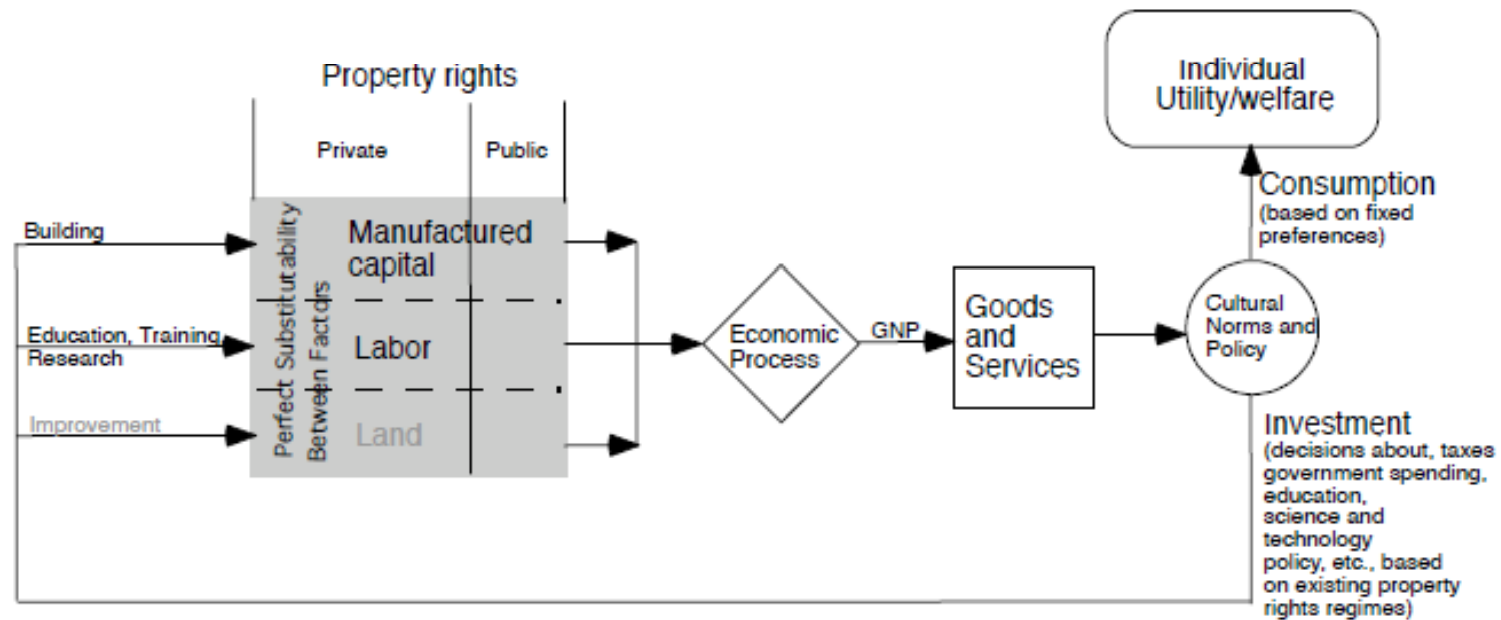
Why the Recent Surge in Interest in ES and PES?

- **Public appreciation of services' value**: As human demands grow and natural resources become more scarce, those who bear the cost of degradation are exploring opportunities to reduce risks and costs by financing environmental conservation
- **New sources of revenue**: The interest of reducing costs, increasing income and expanding conservation is placing markets for ecosystem services at the center stage



These forms of capital are interdependent and to a large extent complementary in contributing to real and sustainable human well-being

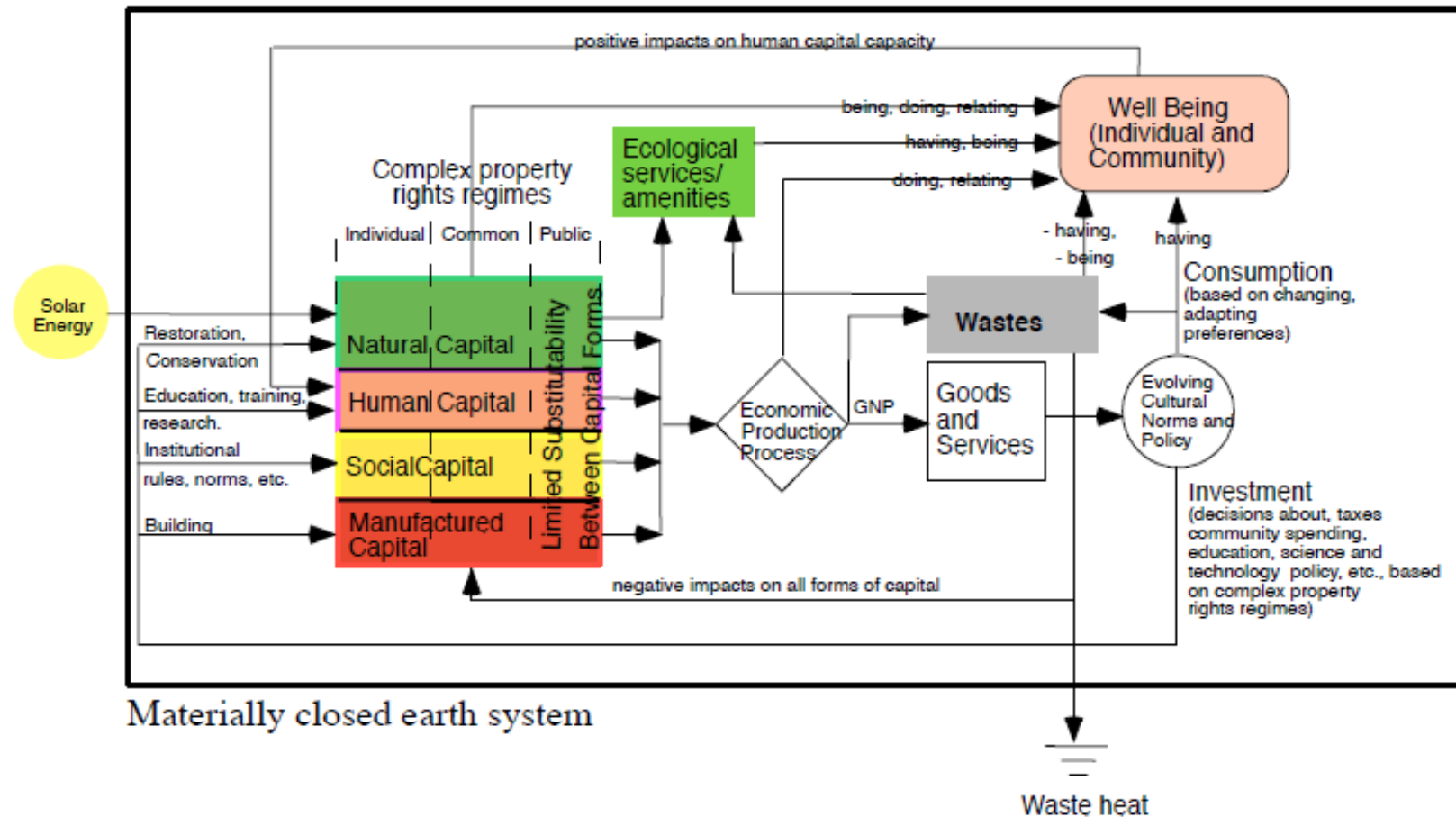
"Empty World" Model of the Economy



Basic premises:

- More is always better
- The economy can grow forever
- Private property is always best

“Full World” Model of the Ecological Economic System



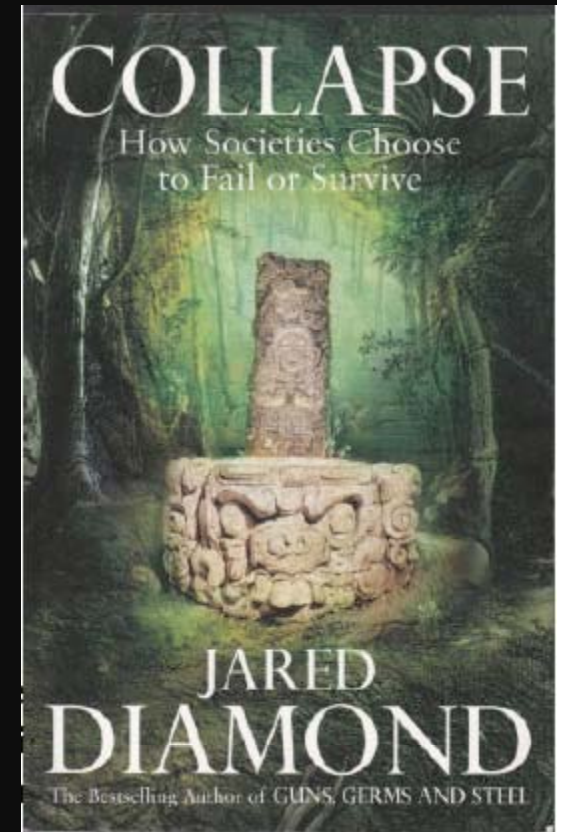
From: Costanza, R., J. C. Cumberland, H. E. Daly, R. Goodland, and R. Norgaard. 1997. An Introduction to Ecological Economics. St. Lucie Press, Boca Raton, 275 pp.

Why should we care about ES and PES?

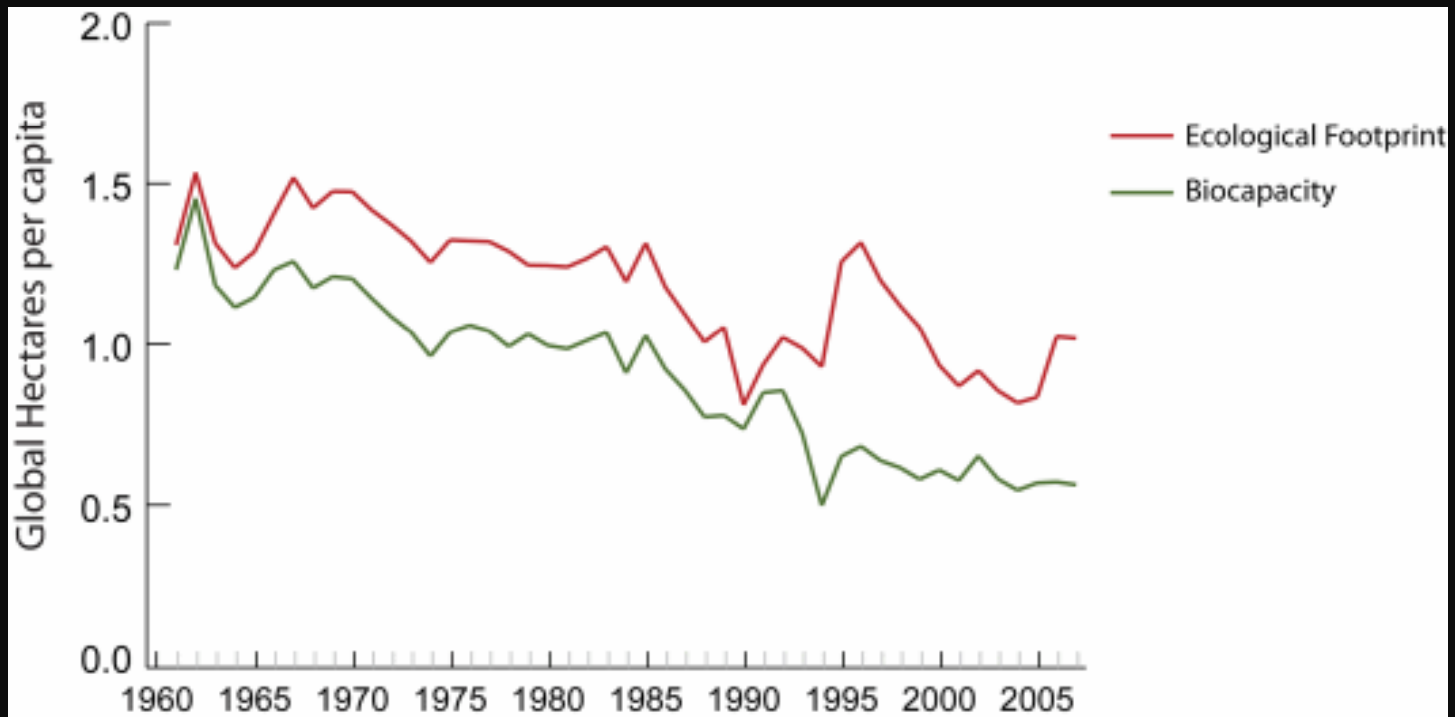
Jared Diamond identified what he considered to be the 12 most serious environmental problems facing past (and future) societies, problems that often have led to the collapse of historical societies:

- 1) Loss of habitat and ecosystem services,
- 2) Overfishing,
- 3) Loss of biodiversity,
- 4) Soil erosion and degradation,
- 5) Energy limits,
- 6) Freshwater limits,
- 7) Photosynthetic capacity limits,
- 8) Toxic chemicals,
- 9) Alien species introductions,
- 10) Climate change,
- 11) Population growth, and
- 12) Human consumption levels.

More importantly, Diamond, and several other authors before him emphasized that **the interplay of multiple factors is almost always more critical than any single factor. Systems that lose resilience are vulnerable to shocks from several sources**



Why Rwanda should care about ES and PES?



This figure tracks the per-person resource demand (Ecological Footprint) and resource supply (Biocapacity) in Rwanda since 1961

Why Rwanda should care about ES and PES?

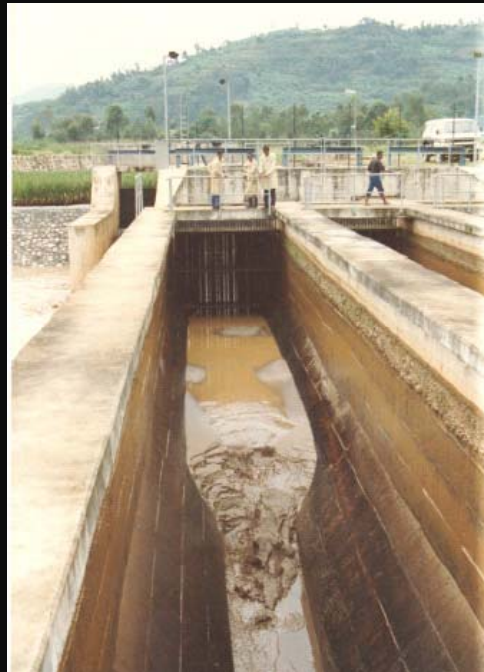
Our economy is dependent on natural and healthy environment:

- Local farmers critically depend upon local ecosystems for survival and are directly affected by changes in availability of ecosystem goods and services (agriculture, water, medicinal plants, firewood, building materials etc.)
- Almost 50% of the agricultural land shows signs of soil erosion indicating a reduction in the capacity of the land to produce food and fiber
- Rwanda has one of the most severe nutrient depletion rates in Africa, with on average -54 kg N, -20 kg P₂O₅, and -56 kg K₂O per ha per year (Stoorvogel and Smaling 1990)



Why Rwanda should care about ES and PES?

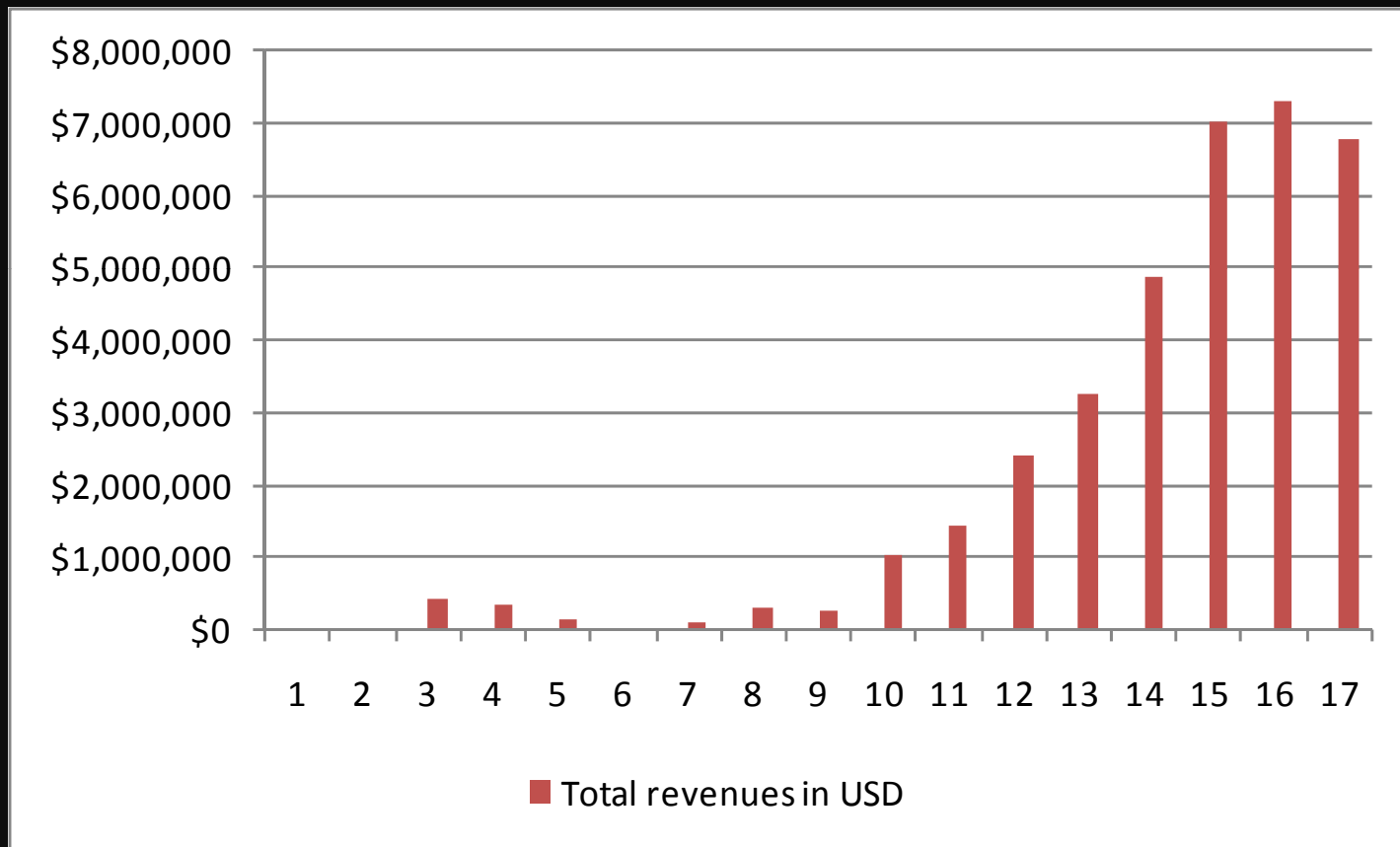
- Due to reduced water flows the generation of electricity from two hydropower stations, Ntaruka and Mukungwa, has declined from **11.25 MW to 2.5 MW** and from **12.45 to 5 MW** respectively in the last two decades (Safari, 2010).
- Increased sedimentation resulting from erosion due to the cultivation of the Gishwati forest led to rising treatment costs of drinking water and higher maintenance costs of water and hydropower plants



The cost of energy per kWh has increased from 7.5 cents USD in 1997 to 20 cents USD in 2005 (NELSAP, 2006).

Why Rwanda should care about ES and PES?

Annual tourism revenue from 1994 to 2009

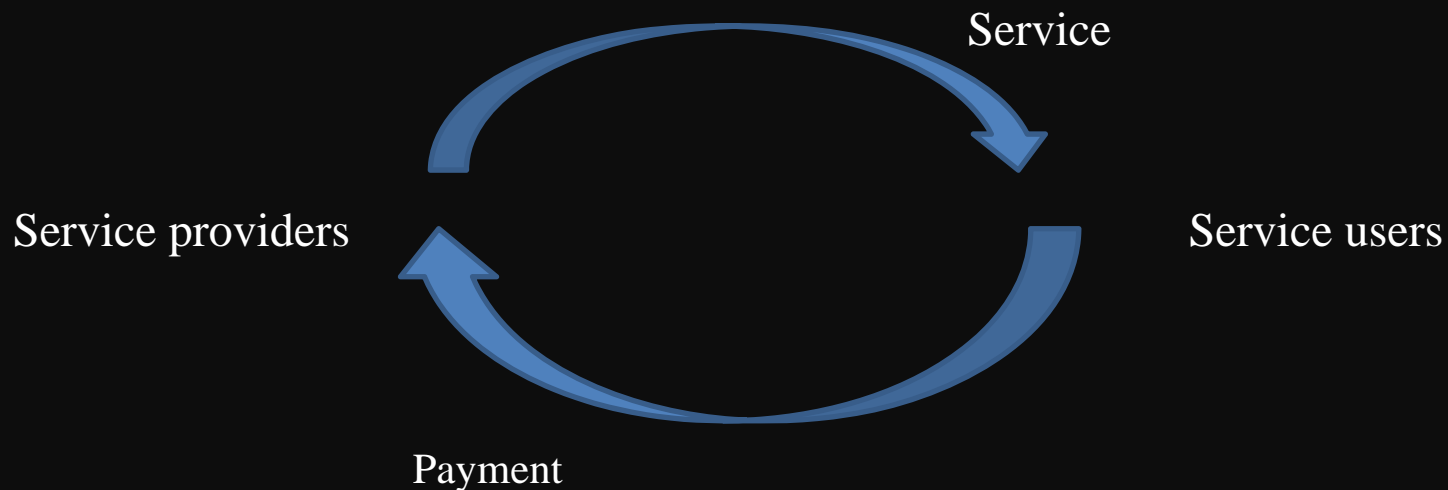


Africa's market share of global international tourism is projected to be 5% by 2020, most likely figure that is dependent upon the maintenance of ecosystems and biodiversity as well as the ability of the hospitality industry to offer increasingly environmentally friendly practices

What is Payments for Ecosystem Services (PES)

A mechanism to improve the provision of indirect environmental services in which

- Those who provide environmental services get paid for doing so ('provider gets')
- Those who benefit from environmental services pay for their provision ('user pays')
- Payments are conditional
- Participation is voluntary



Market and Payment Types

Environmental commodities comprising current PES programs

Carbon

- Payments for carbon sequestration or storage for climate change mitigation

Water

- Payments for management activities that improve the flow and/or quality of water

Biodiversity

- Payments to maintain habitats (offsets or for scenic beauty) or species (i.e. tourism, direct payments or species banking) or payments for wild harvested products (i.e. Wildlife Friendly Enterprises)

Major market types

Compliance market: Driven by regulation and enforcement

Voluntary markets: Driven largely by CSR and/or the threat of future regulation

Government-mediated markets: Government run programs that use public funds to pay individuals for ecosystem service management

Core Requirements for Successful PES

- **Discrete providers**

Can't pay everyone!

- **Discrete beneficiaries**

Can't charge everyone!

- **Perceived scarcity and value of the service**

Why pay for what has always been free?

- **Mechanism for providers and sellers to agree on price**

- **Procedures for implementation, oversight and dispute resolution**

- **Robust “business case” or driver of demand (voluntary, regulatory)**

Procedures for implementation, oversight and dispute resolution

- **Importance of metrics**

- **What am I paying for? What am I getting?**

- **Low transaction costs**

- **Will the monitoring or dispute resolution costs exceed the payments?**

Robust business cases

Possible business cases for buyers

Business

- **Decrease operational risk cost-effectively**
- **Lower regulatory risk**
- **Strengthen reputation / brand**
- **Meet CSR goals**
- **Satisfy regulations**

Government

- **Improve environmental quality for citizens**
- **Foster rural sustainable livelihoods**
- **Implement lower cost option vs. engineered solution**
- **Try alternative approach to regulation**

NGOs / foundations

- **Fulfill mission**

Ex: Business cases



Economic costs



Social costs

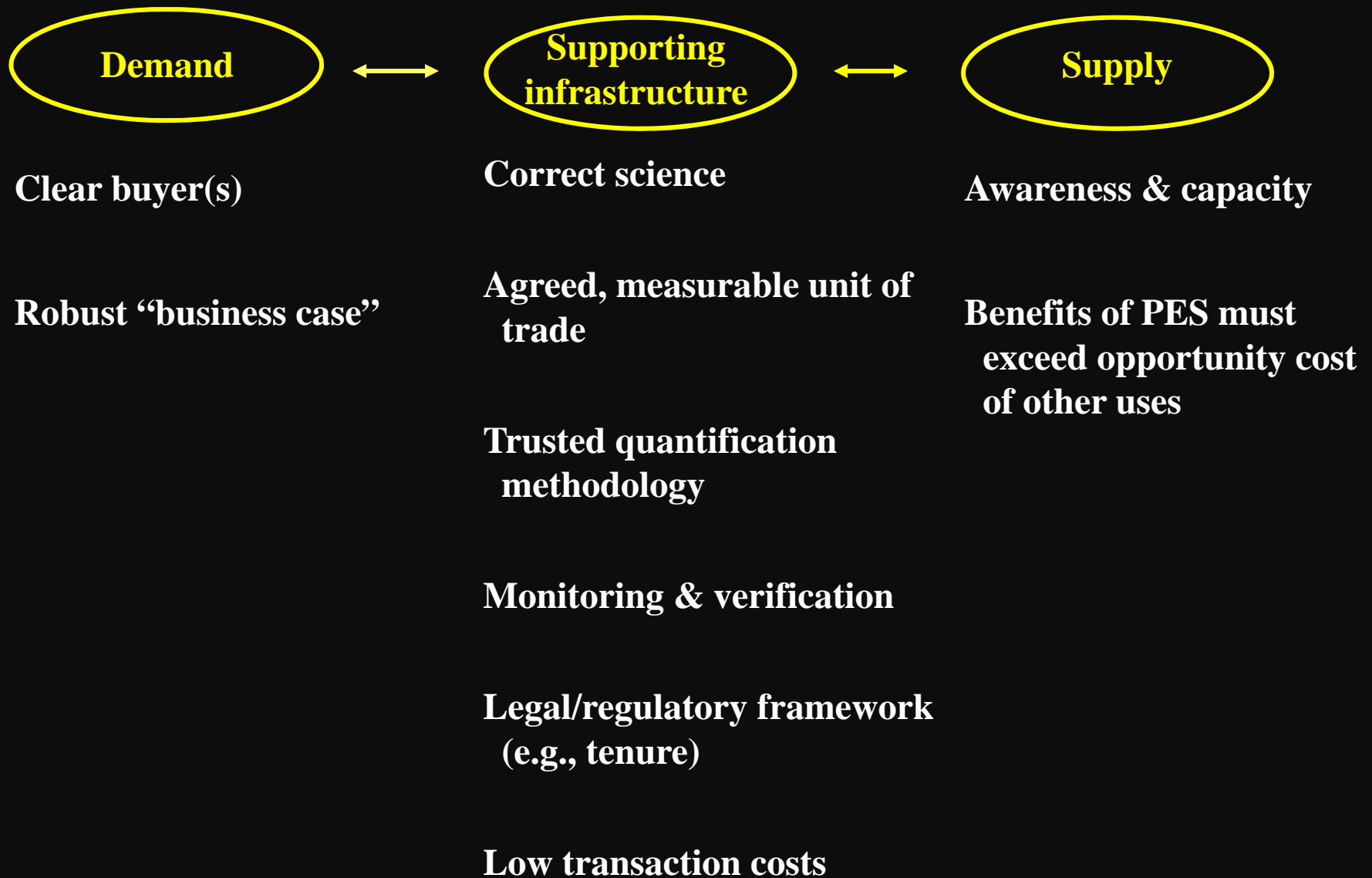
Ex: Business cases

Country	Energy cost (US\$/kg made tea)	% of current market price of tea	Grid Electricity cost (US\$/kg made tea)	Diesel cost (US\$/ton made tea)	Thermal cost (US\$/ton made tea)	Electricity Bill as % of total energy bill
Kenya	0.11	6%	0.06	4	43	60%
Malawi	0.07	8%	0.04	8	21	62%
Uganda	0.12	11%	0.06	30	27	82%
Tanzania	0.11	10%	0.05	41	18	80%
Rwanda	0.34	25%	0.22	87	33	80%
Burundi	0.09	7%	0.04	21	28	70%
Mozambique	0.16	12%	0.02	124	13	65%

Source: IED

Small hydropower which is generally available at or near tea estates can provide a clean and reliable source of renewable energy while reducing costs to tea factories at the same time????

Payments for ecosystem services - key success factors



Institutional, legal and policy frameworks

- **Institutions or rules: typically sectoral based legislation (land, water, wildlife, forestry) that are not integrated and are primarily control based**
- **Legislation that stimulates (e.g .New York): National law gives government authority to compensate farmers for converting eligible cropland to more resource conserving-land uses**
- **Legislation that leads (Costa Rica): National law gives government authorities to pay landowners for ecosystem services provided by their land**

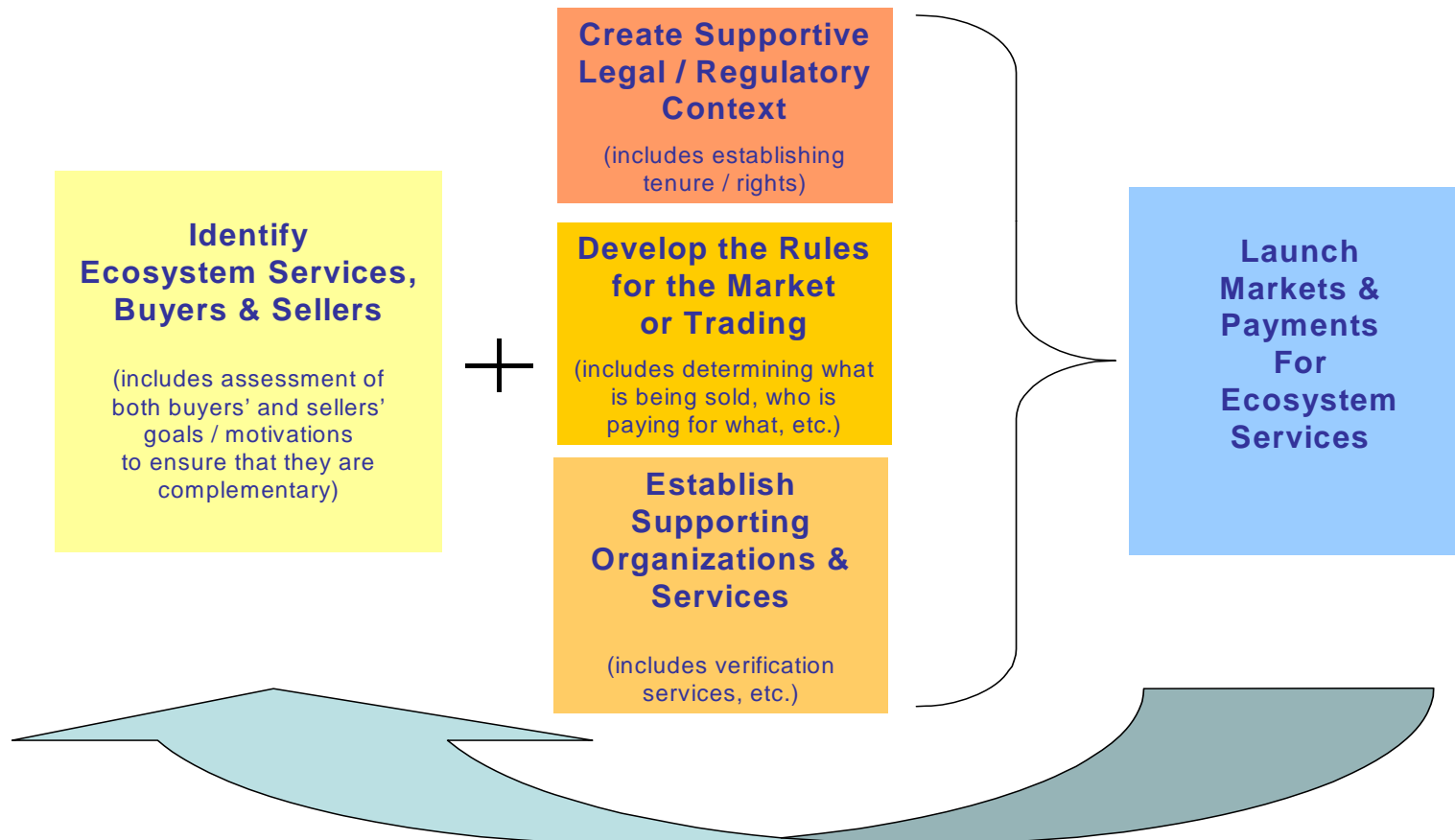
Case Studies

Case example	Motivation for watershed effort	Source of funds
Costa Rica: A National Payment for Environmental Services Program	National law gives government authorities to pay landowners for ecosystem services provided by their land	Tax on fossil fuels, World Bank loan, GEF grant, sale of carbon credits
Quito, Ecuador: Watershed Trust Fund	Protect quality and supply drinking water, as well as ancillary biodiversity and conservation benefits	Voluntary contributions from water supplier, electricity supplier, and NGOs; user fees
Cauca Valley water-user Associations, Colombia	To ensure water flows for dry-season irrigation	Water-user fee, collected through associations
Perrier Vittel: Direct payments by the company to farmers	Protect its source for high-priced bottled spring water, thereby increasing profits	Perrier Vittel

Key Issues/Challenges

- **Limited awareness:** What is PES? How does it work? How should it be designed?
- **Lack of homegrown capacity/institutions:** high dependence on external experts – very costly
- **Who should be paid?** – Property rights not always clear
- **Lack of start up capital** to cover the transaction costs
- **Very few Government led efforts** –though that is changing with REDD

Building Blocks for Ecosystem Services Payments and Markets



Adapted from Brand, David. 2002. "Investing in the Environmental Services of Australian Forests," in S. Pagiola, J. Bishop, and N. Landell-Mills (editors). *Selling Forest Environmental Services: Market-Based Mechanisms for Conservation and Development*. London, U.K.: Earthscan Publications.

PES in Rwanda

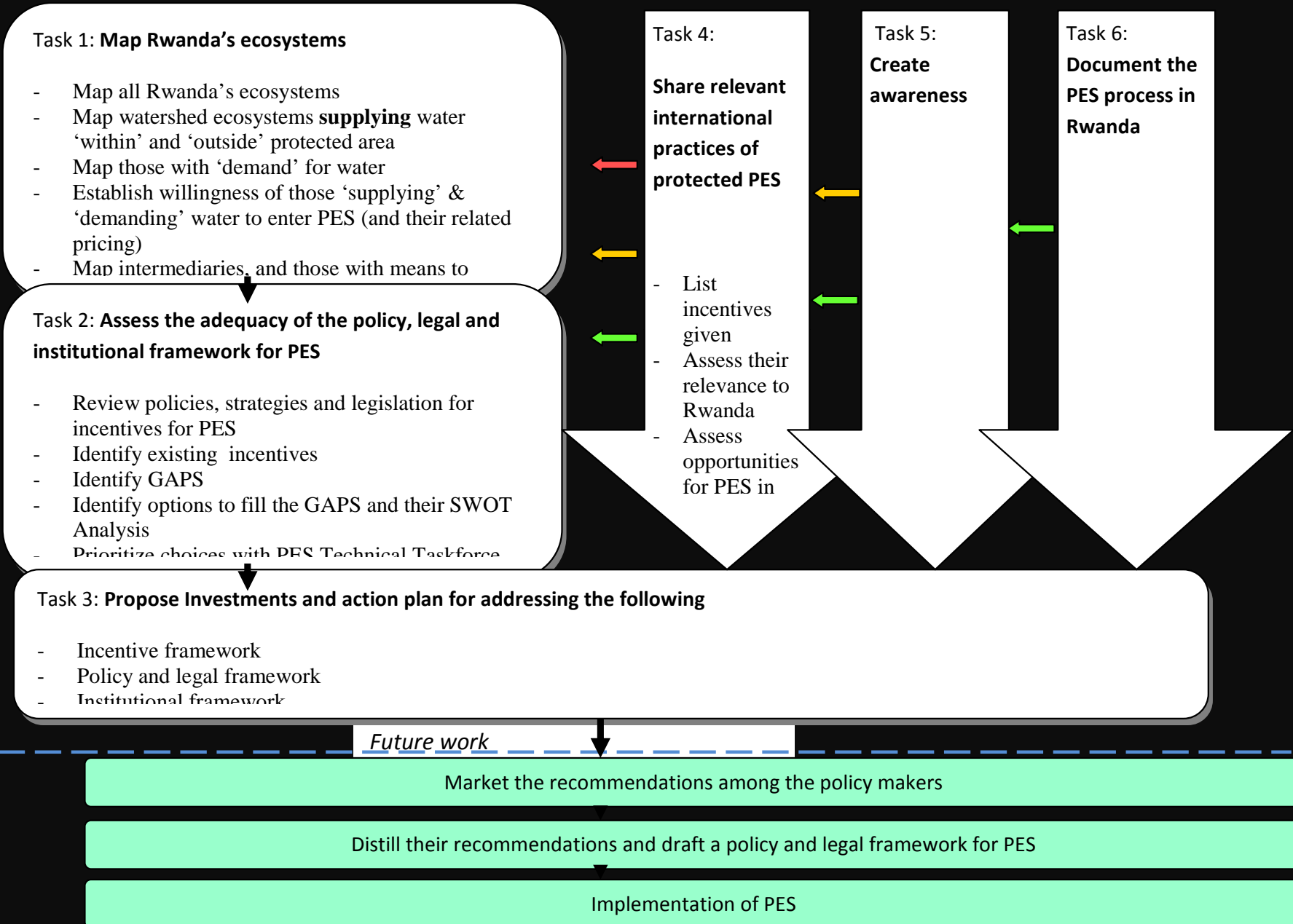
- Scattered initiatives without coordination (MINAGRI, RDB, REMA, MININFRA etc.)
- Creation of a national PES Technical Task Force (TTF)

The main roles of the TTF:

-Advise, guide and provide technical leadership in the development of a national framework for developing and implementing PES

-Assess legal, institutional and policy needs, opportunities, strategies and constraints to PES development

Block of tasks necessary to operationalize Payment for Ecosystem Services



Payments for Ecosystem Services: Some key questions

1. What are the motivations for establishing the PES scheme?
(Conservation, pro-poor/livelihoods, development?)
2. Is the PES the right policy instrument?
3. Are there any other PES projects in your region? Country?
4. What kind of PES scheme would seem to be feasible, or what kind of scheme would you like to have a feasibility study?
5. What would be the scale of the PES scheme? Watershed, landscape, or larger scale?

Thank you!

Essential Components for Ecosystem Services Market Growth

Public Payment Schemes

Open Trading

Self-Organized Private Deals

Component 1

Identified Ecosystem Services

(includes: ecosystem services for available for both current and future payments / markets)

Component 2

Enabling Legal, Regulatory, & Administrative Context

(includes: supportive context for ecosystem service payments and markets)

Component 3

Supporting Institutions

(includes: public or private entities that facilitate / oversee public funds, regulate private trade, etc.)

Component 4

Engaged Local Communities & Stakeholders

(includes: communities, NGOs, financial institutions, businesses, government, etc.)

Component 5

Flow of Market Information

Component 6

Technical Assistance

(to sellers, buyers, and other market actors, which includes training, education, and advising)

Component 7

Financing

(for all needed components, including: ecosystem management costs, transaction costs, etc.)

Component 8

Support Services For Market Actors

(such as: brokering, legal advice, measurement and valuation of ecosystem services, 3rd party verification, accounting, etc.)

Component 9

Standards and Guidelines

for Ecosystem Service Payments or Markets

Component 10

Awareness of Ecosystem Service Values, Payments & Markets

(among policymakers as well as potential sellers and buyers)

Critical steps

Step 1. Ecosystem Services Assessment

1. What are the critical - ecosystem services provided by your landscape (the ones most likely to be a source of risk and opportunity for businesses, affect/improve local livelihoods)?
2. What are the conditions and trends of the selected ecosystem services?
Are the ecosystem services scarce or declining?
3. What are the major threats to the ecosystem services in your landscape?
4. What activities or initiatives are underway to protect those?
5. Are there economic activities linked to the ES? How do you rate their relative importance to the region or country?
6. Do these ecosystem services serve as inputs or do they enable/enhance conditions for successful businesses/economic/agricultural performances in your region (e.g. timber is an input for wood product manufacturers and freshwater is an input for beverage company, hydropower producer, and agriculture production through irrigation)?

Step 1. Ecosystem Services Assessment Cont.

7. If yes, to question 1.6. Do these ecosystem services have cost effective substitutes? (For instance hydroelectric facilities are highly dependent upon freshwater. Gas and oil are substitutes to hydroelectricity but they are expensive in some countries).
8. Is there a strong link between land use actions and watershed service? How is this demonstrated?

Example Valuation Techniques

- **Avoided Cost (AC):** services allow society to avoid costs that would have been incurred in the absence of those services; flood control provided by barrier islands avoids property damages along the coast.
- **Replacement Cost (RC):** services could be replaced with man-made systems; nutrient cycling waste treatment can be replaced with costly treatment systems.
- **Factor Income (FI):** services provide for the enhancement of incomes; water quality improvements increase commercial fisheries catch and incomes of fishermen.
- **Travel Cost (TC):** service demand may require travel, whose costs can reflect the implied value of the service; recreation areas attract distant visitors whose value placed on that area must be at least what they were willing to pay to travel to it.
- **Hedonic Pricing (HP):** service demand may be reflected in the prices people will pay for associated goods: For example, housing prices along the coastline tend to exceed the prices of inland homes.
- **Marginal Product Estimation (MP):** Service demand is generated in a dynamic modeling environment using production function (i.e., Cobb-Douglas) to estimate value of output in response to corresponding material input.
- **Contingent Valuation (CV):** service demand may be elicited by posing hypothetical scenarios that involve some valuation of alternatives; people would be willing to pay for increased preservation of beaches and shoreline.
- **Group Valuation (GV):** This approach is based on principles of deliberative democracy and the assumption that public decision making should result, not from the aggregation of separately measured individual preferences, but from *open public debate*.

Step 2. Payments for Ecosystem Services Assessment Cont.

6. What are the potential risks and opportunities of using different market instruments? Have you ever put in place any market instruments? Is there a business or financial plan for your landscape with ideas on revenue generation?
7. Do you see any market potential for ES? If so, who would pay whom for the service? What form should the payment take? (Individual monetary payment, improvements in public services, local infrastructure development)?

Step 3. Stakeholders Assessment

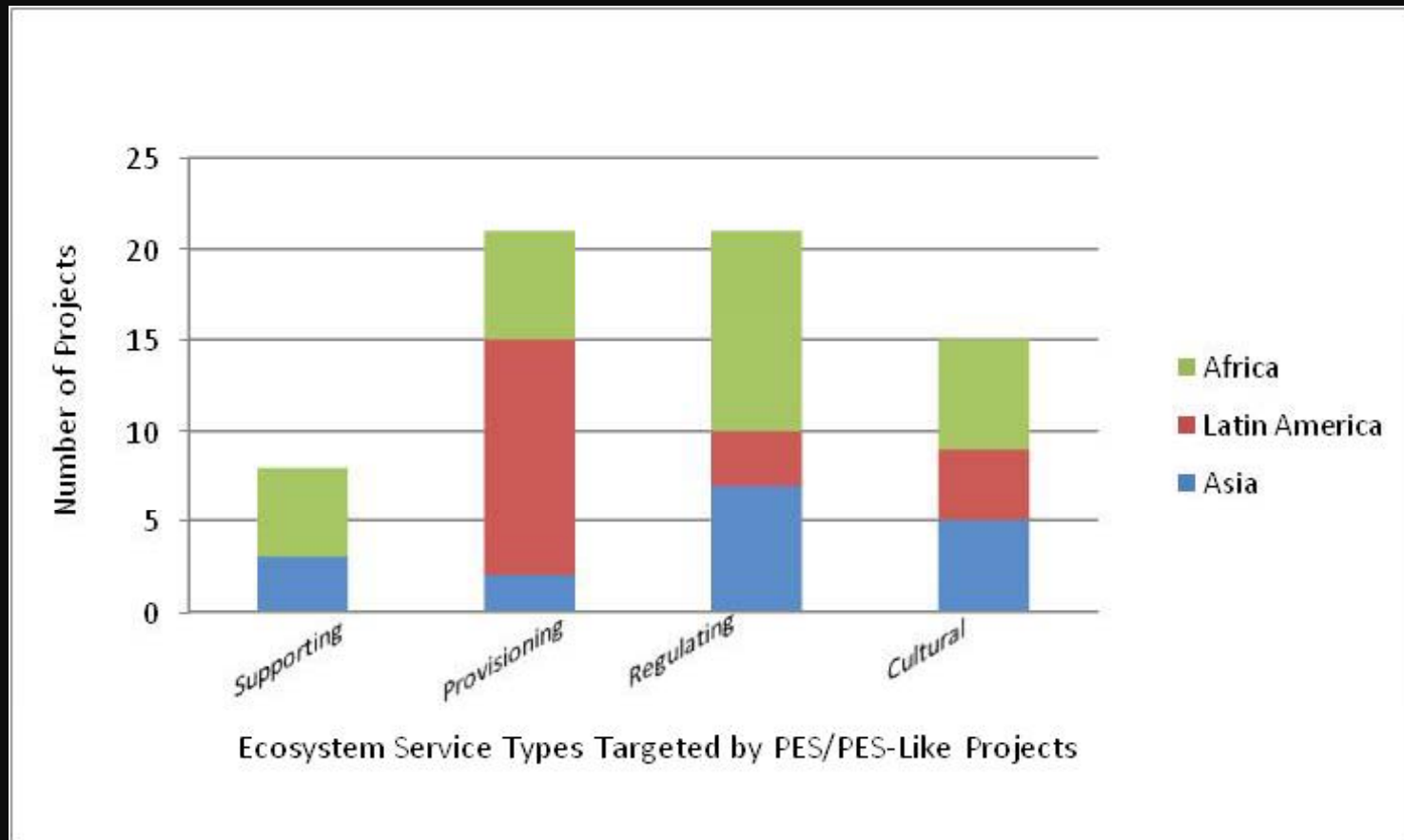
1. Who are the potential stakeholders in the PES schemes? Potential sellers, buyers, intermediaries and donors?
2. Are there multiple suppliers who will compete to provide the service?
3. Who are the main stakeholders and what is their level dependency and/impacts on selected ecosystem services?
4. Which of the beneficiaries have the willingness and the ability to pay?
5. Are there tools/mechanisms in place to convince the beneficiaries to pay? What are their needs, motivations, expectations and barriers to engage in PES?
6. What is the level of awareness of ES valuation and PES in your region/country?

Step 4. Institutional and Legal Framework Assessment

1. Does a national or regional regulatory framework exist to support PES?
2. Does a national or regional regulatory framework inhibit PES?
3. Do landowners have clear, legal rights to ES and thus able to sell them?
4. Do community organizations or concessionaires have rights to sell/approve/reject deals?
5. Are there government agencies that regulate and manage the ES?
6. Is there proper coordination between relevant authorities- Who are they?
7. Have government agencies or institution expressed any interest in PES? If so what has been attempted (or not attempted) and with what results? If there has been no progress, what have been the institutional constraints?

Case example	Motivation for watershed effort	Source of funds
Costa Rica: A national Payment for Environmental Services Programme	National law gives government authority to pay landowners for ecosystem services provided by their land	Tax on fossil fuels; World Bank loan; Global Environment Facility grant; sale of carbon credits
Paraná, Brazil: Ecological Value-Added Tax	State law earmarks 5% of value-added tax revenue to municipalities for critical watershed or conservation land	General tax on goods and services (value-added tax)
Colombia: Ecological Services Tax	National law establishing regional agencies responsible for watershed management	Property taxes; hydroelectric revenues; industrial water user fees
United States: Conservation Reserve Programme	National law gives government authority to compensate farmers for converting eligible cropland to more resource-conserving land uses	General taxpayer revenues
European Union: Agri-Environment Programmes	Regulation enacted by European Union	General EU budget for agricultural purposes
United States: Pollution Cap-and-Trade Schemes	National policy to reduce cost of achieving non-point pollution targets under Clean Water Act	Public and private polluting enterprises, some state and federal funding
New South Wales, Australia: Salinity Cap-and-Trade Scheme	State programme to reduce salinity of land and water cost-effectively	Salinity-emitting enterprises; Public and private investors in a state-run environmental services fund
Perrier Vittel: Direct payments by the company to farmers	Protect its source for high-priced bottled spring water, thereby increasing profits	Perrier Vittel
Quito, Ecuador: Watershed Trust Fund	Protect quality and supply of drinking water, as well as ancillary biodiversity and conservation benefits	Voluntary contributions from water supplier, electricity supplier, and NGOs; funding eventually to come from user fees
La Manguera SA: Costa Rican hydropower producer voluntarily pays a conservation organization to protect upper watershed	To ensure water flows for dry-season electricity production	Hydropower revenues
Cauca Valley Water-User Associations, Colombia	To ensure water flows for dry-season irrigation	Water-user fee, collected through the associations
New York City: A negotiated agreement with watershed communities	To avoid the cost of a filtration plant required under federal drinking water rules	Taxes on NYC water bills; municipal bond issues

WCS PES Initiatives



Number of Countries with PES programs:
Asia=6; Africa=8; Latin America=9

Examples of PES Projects in Development or Underway at WC

	WCS Examples	PES
Wildlife Friendly Enterprises or Specialty Certified Products	COMACO Ibis Rice/Cambodia	Consumers pay a premium price for a provisioning service that also ensures other ecosystem services are being provided (wildlife conservation)
Payments for Water Services	Rwanda	Under development. Tea and utilities (hydro) companies will pay for watershed services provided by Nyungwe NP
Payments for Carbon Storage (REDD)	Makira/Madagascar; Cambodia/Seima Protected Area	Communities may be paid to reduce deforestation and WCS may receive funding to manage a protected area as part of the core project area
Conservation Easement	Tarangire National Park, Tanzania	Tour operators pay communities not to convert grasslands into agriculture but to maintain them for wildlife grazing

ES and PES: What should we do next?

Fundraising: Help raise funds to support work at Scapes related to ES and PES

Provide Technical Support:

- Spread and leverage knowledge, skills and guidance materials on development of ES and PES projects across the organization and externally
- Support the development and progress of ES/PES programs at Scapes
- Adapt and development of new tools and ideas **such as** tools for assessing Ecosystem Services across a Scape and assessing PES feasibility

Dissemination: Document and disseminate WCS case studies and experiences with ES and PES projects for influencing policy, promoting WCS work in this area and supporting fundraising for Scapes

Other Ideas???