

# Payments for Ecosystem Services in the Commons

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## ABSTRACT

The various commons of the Earth hold the life support systems that sustain us and all other life forms—free of charge. At present, payments for ecosystem services represent an economic mechanism for valuing and conserving commons and their essential life support functions. As a transition to a new worldview that embraces intrinsic value of natural and managed commons transcending economics, payments for ecosystem services may serve as a temporary bridge towards building a sustainable mindset and future. This paper presents examples of payments for hydrological services by New York City water users, carbon credits for indigenous community forests of Zapotecs in Oaxaca, Mexico and Menominee Nation in Wisconsin, USA, and reducing emissions from deforestation and forest degradation issues in establishing oil palm plantations displacing native peat swamp forests in Indonesia.

## KEYWORDS

Payments for ecosystem services, commons, sustainability, life support systems, REDD

## INTRODUCTION

To start on common ground, a preliminary overview of “commons” (**Box 1**), “common-pooled resources” (**Box 2**), and “solutions to tragedy of the commons” (**Boxes 3 and 4**) serve as a framework for introducing “payments for ecosystem services” (**Box 5**). To illustrate PES in action, two brief examples are presented—hydrological services in New York City Watershed and carbon sequestration and valuation in Oaxaca, Mexico and Menominee Reservation, USA. Finally, a current PES challenge—Reducing Emissions from Deforestation and Forest Degradation (REDD)—is illustrated by controversial palm oil plantations displacing native peat swamp forest lands in Indonesia.

Controversy exists whether governmental regulation, privatization, or some other strategy can work to protect common resources and to prevent a “tragedy of the commons”—a phrase coined by Garrett Hardin (1968) for which he called for “mutual coercion mutually agreed upon” to address the challenge in terms of population growth. Stewart (2007) provides a clear, concise discussion of shared resources in context of the world’s oceans with basic concepts readily transferrable to most if not all commons, as summarized in **Box 1**. Generally, the context of payments for ecosystems services falls into the category of market-driven mechanisms to bestow economic value to natural and managed ecosystems either as common property or open access resources in the commons.

**Box 1. Tragedy of the Commons**  
(from Stewart, 2007)

The Basic Idea. If a resource is held in common for use by all, then ultimately that resource will be destroyed.

'Freedom in a common brings ruin to all.' To avoid the ultimate destruction, we must change our human values and ideas of morality.

1. 'Held in common' means the resource is owned by no one, or owned by a group, all of whom have access to the resource.
2. 'Ultimately' means after many years, maybe centuries. The time interval is closely tied to population increase of those who have access to the resource. The greater the number of people using a resource, the faster it is destroyed. Thus the Tragedy of the Commons is directly tied to over population.
3. The resource must be available for use. Iron in earth's core is held in common, but it is inaccessible, and it will not be destroyed.
4. Resources held by individuals, even if the individual destroys the resource, is not an example of the Tragedy of the Commons.
5. Hardin used the word 'tragedy' as the philosopher Whitehead used it: *The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things.* He [Whitehead] then goes on to say, *'This inevitableness of destiny can only be illustrated in terms of human life by incidents which in fact involve*

*unhappiness. For it is only by them that the futility of escape can be made evident in the drama.* (Hardin, 1968)

Once the stage is set in a dramatic tragedy, there is no escape from the unhappy ending.

6. Note that the tragedy does not need to follow from greed. In the example below, we all breathe the air. This degrades the common resource: air. But we breathe not because we are greedy, but because we want to live. Any sustained increase of population in a finite biosystem ends in tragedy.  
*In brief, tragedy is logically dependent only on the assumption that there is steady growth in the use of land or resources within any finite ecosystem; it is not logically dependent on the conventions of any specific political and economic system.* (Elliott, 1997)
7. We can avoid tragedy only by altering our values, by changing the way we live. There is no technical solution.  
*The general statement of the tragedy of the commons demonstrates that an a priori ethics constructed on human-centered, moral principles and a definition of equal justice cannot prevent and indeed always supports growth in population and consumption. Such growth, though not inevitable, is a constant threat. If continual growth should ever occur, it eventually causes the breakdown of the ecosystems which support civilization. ... Specifically, Hardin's thought experiment with an imaginary commons demonstrates*

**Box 1. Tragedy of the Commons**  
(continued)

*the futility -the absurdity- of much traditional ethical thinking. (Elliott, 1997)*

Garrett Hardin rephrased his idea in 1985:

*As a result of discussions carried out during the past decade I now suggest a better wording of the central idea: Under conditions of overpopulation, freedom in an unmanaged commons brings ruin to all. (Hardin, 1985)*

Examples of Common Resources.

1. Air. No one owns the air, it is available for all to use, and its unlimited use leads to air pollution.
2. Water. Water in the seas, estuaries, and the ocean is a common resource. But, water in lakes and rivers is often owned by cities, farmers, or others, especially in the western US.
3. Fish of the sea. Hardin writes that *In 1625, the Dutch scholar Hugo Grotius said, 'The extent of the ocean is in fact so great that it suffices for any possible use on the part of all peoples for drawing water, for fishing, for sailing' Now the once unlimited resources of marine fishes have become scarce and nations are coming to limit the freedom of their fishers in the commons. From here onward, complete freedom leads to tragedy.*

A General Statement of the Tragedy of the Commons. The philosopher Herschel Elliott (1997) states that there

are four general premises that entail the tragedy of the commons:

1. *The Earth is finite: it has a limited stock of renewable fuels, minerals, and biological resources, a limited throughput of energy from the sun, and a finite sink for processing wastes.*
2. *Although human activity very often does occur on privately owned lands which are not a commons, that and all other human activities take place in some larger natural commons. And that larger commons is a limited biosystem which is in a dynamic, competitive, and constantly evolving equilibrium. The equilibrium of an ecosystem can usually accommodate any activity on the part of its members as long as that activity is limited in amount and/or is practiced only by a small population. But continuous growth in the numbers of any organism or in its exploitation of land and resources will eventually exceed the capacity of the ecosystem to sustain that organism.*
3. *Now for the first time on global scale human beings are exceeding the land and resource use which the Earth's biosystem can sustain.*

*Certainly it is true, as Hardin noted, that individuals who seek to maximize their material consumption contribute to the ever increasing exploitation of the world's commons. But it is also true that all who follow the rarely questioned principles of humanitarian ethics -- to save all human lives, to relieve all human misery, to prevent and cure disease, to foster universal human*

**Box 1. Tragedy of the Commons**  
(continued)

*rights, and to assure equal justice and equal opportunity for everyone -- do so also. (Elliott, 1997)*

Some Consequences. The large and rapid increase in population since the beginning of the anthropocene has altered the global commons. Will our atmosphere, rivers, lands, and ocean ultimately be destroyed because they are held in common for use by all? Will we place ever stronger restrictions on their use? Or will we limit the population of the world?

*Its message is, I think, still true today. Individualism is cherished because it produces freedom, but the gift is conditional: The more the population exceeds the carrying capacity of the environment, the more freedoms must be given up. As cities grow, the freedom to park is restricted by the number of parking meters or fee-charging garages. Traffic is rigidly controlled. On the global scale, nations are abandoning not only the freedom of the seas, but the freedom of the atmosphere, which acts as a common sink for aerial garbage. Yet to come are many other restrictions as the world's population continues to grow. (Hardin, 1998)*

Jared Diamond in his book *Collapse* describes in detail the collapse of civilizations that failed to solve the problem of the Tragedy of the Commons. He writes of Pitcairn and Henderson Islands in the Pacific: *Many centuries ago, immigrants came to a fertile land blessed with apparently inexhaustible resources. While the land lacked a few raw materials useful for*

*industry, those materials were readily obtained by overseas trade with poorer lands that happened to have deposits of them. For a time, all the lands prospered, and their populations multiplied.*

*But the population of that rich land eventually multiplied beyond the numbers that even its abundant resources could support. As its forests were felled and its soils eroded, its agricultural productivity was no longer sufficient to generate export surpluses, build ships, or even to nourish its own population. With that decline of trade, shortages of the imported raw materials developed. Civil war spread, as established political institutions were overthrown by a kaleidoscopically changing succession of local military leaders. The starving populace of the rich land survived by turning to cannibalism. Their former overseas trade partners met an even worse fate: deprived of the imports on which they had depended, they in turn ravaged their own environment until no one was left alive. (Diamond, 2005)*

Solutions. Tragedy is not inevitable. Jared Diamond described how some societies avoided tragedy, at least locally. The people of Tikopia, Japan, and the New Guinea highlands saved their forests and the agrarian economy which depended on forests. All limited their population to what could be sustained by their economy.

There Is No Technical Solution. Hardin points out that the Tragedy of the Commons is an example of the class of problems with no technical solution, where:

**Box 1. Tragedy of the Commons**  
(continued)

*A technical solution may be defined as one that requires a change only in the techniques of the natural sciences, demanding little or nothing in the way of change in human values or ideas of morality. (Hardin, 1968).*

We Must Change Our Values: Mutual Coercion. Therefore, any solution requires that we, as a society, change our values of morality. For example, we may decide that unlimited use of air is no longer morally acceptable. Hardin states one solution is 'Mutual Coercion Mutually Agreed Upon.' We, as a society, agree that some actions are not allowed (the mutual agreement), and that violations of the agreement leads to fines or prison terms (the Coercion). Thus, we have some restrictions on what can be put into the air. The US Environmental Protection Agency regulates the amount of pollutants that can be released into the air. Failure to comply with the regulations leads to fines or prison sentences.

Hawaiian Islanders protected their environment and fisheries for a thousand years by a unique system of local ownership extending from the sea to the headwaters of streams feeding into the sea. Violations of the rules (taboos) could lead to the death penalty. This was 'mutual coercion mutually agreed upon' in the extreme.

More General Solutions. In addition, morals or ethics can lead to changes in use of the resource. How can this be done? Ostrom et al. (1999) provide a possible answer.

*Solving [commons] problems involves two distinct elements:*

- 1. Restricting access, and*
- 2. Creating incentives (usually by assigning individual rights to, or shares of, the resource) for users to invest in the resource instead of overexploiting it.*

*Both changes are needed. For example, access to the north Pacific halibut fishery was not restricted before the recent introduction of individual transferable quotas and catch limits protected the resource for decades. But the enormous competition to catch a large share of the resource before others did resulted in economic waste, danger to the fishers, and reduced quality of fish to consumers. Limiting access alone can fail if the resource users compete for shares, and the resource can become depleted unless incentives or regulations prevent overexploitation. (Ostrom et al., 1999)*

Restricting access ultimately involves limiting population, especially when the common being accessed is a global system.

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Elinor Ostrom, recipient of the 2009 Nobel Prize in economic sciences, asserts that grassroots people provide the most effective management of common-pooled resources (CPRs, see **Box 2**); not governmental regulation or private ownership/marketplace. She identified design principles that characterize successful attempts by groups able to organize and manage their behavior to sustain their commons locally (Ostrom, 1990, from Table 3.1. Design principles illustrated by long-enduring CPR institutions, p. 90):

1. Clearly defined boundaries. Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself.
2. Congruence between appropriation and provision rules and local conditions. Appropriation rules restricting time, place, technology and/or quantity of resource units are related to location conditions and to provision rules requiring labor, material, and/or money.
3. Collective-choice arrangements. Most individuals affected by the operational rules can participate in modifying the operational rules.
4. Monitoring. Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.
5. Graduated sanctions. Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.
6. Conflict-resolution mechanisms. Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7. Minimal recognition of rights to organize. The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.

*For CPRs that are parts of larger systems:*

8. Nested enterprises. Appropriation, provision, monitoring, enforcement, conflict resolution and governance activities are organized in multiple layers of nested enterprises.

**Box 2. Common-pool resources**

(Ostrom, 1990; cited from Wikipedia, 2010)

Common-pool resources may be owned by national, regional or local governments as public goods, by communal groups as common property resources, or by private individuals or corporations as private goods. When they are owned by no one, they are used as open access resources. Having observed a number of common pool resources throughout the world, Elinor Ostrom noticed that a number of them are governed by common property regimes - arrangements different from private property or state administration - based on self-management by a local community. Her observations contradict claims that common-pool resources should be privatized or else face destruction in the long run due to collective action problems leading to the overuse of the core resource [e.g., Tragedy of the Commons].

My interpretation of Ostrom’s insightful work is that payments for ecosystem services provided by common-pool resources may not be the ultimate solution—behavior change—but might serve as a helpful transition mechanism along a piecemeal, stepwise change continuum towards sustainability. Place-based shared knowledge within a cultural context of values, community organization, planning, and management by local inhabitants of their natural resources may serve as the base for designing and maintaining sustainability. Additionally, “spaceship Earth” regulations and enforcement by nation-states and communities of nations to maintain planetary life support systems are warranted, but we cannot wait for policy-makers and planners to protect us. As Ostrom advises, grassroots action is key.

“Mutual coercion, mutually agreed upon” is Garrett Hardin’s (1968) solution to avoiding tragedies of the commons (see **Box 3**). This is most readily plausible at the grassroots level in local communities. To the extent that local maintenance of place-based life support systems within a village or community’s jurisdiction on spaceship Earth (or Mother Earth as deemed by many people) through agreement to protect the shared commons is possible, local control is desirable and may be sufficient.

**Box 3.** *Solution: Mutual coercion mutually agreed upon*  
(from Hardin, 1968)

*The tragedy of the commons as a food basket is averted by private property, or something formally like it. But the air and waters surrounding us cannot readily be fenced, and so the tragedy of the commons as a cesspool must be prevented by different means, by coercive laws or taxing devices that make it cheaper for the polluter to treat his pollutants than to discharge them untreated. We have not progressed as far with the solution of this problem as we have with the first. Indeed, our particular concept of private property, which deters us from exhausting the positive resources of the earth, favors pollution. (p. 1245, Hardin, 1968).*

*What shall we do? We have several options. We might sell them off as private property. We might keep them as public property, but allocate the right*

*to enter them. The allocation might be on the basis of wealth, by the use of an auction system. It might be on the basis of merit, as defined by some agreed-upon standards. It might be by lottery. Or it might be on a first-come, first-served basis, administered to long queues. These, I think, are all the reasonable possibilities. They are all objectionable. But we must choose--or acquiesce in the destruction of the commons that we call our National Parks. (p. 1245, Hardin, 1968).*

#### Recognition of Necessity

*Perhaps the simplest summary of this analysis of man's population problems is this: the commons, if justifiable at all, is justifiable only under conditions of low-population density. As the human population has increased, the commons has had to be abandoned in one aspect after another.*

*First we abandoned the commons in food gathering, enclosing farm land and*

**Box 2. Solution: Mutual coercion mutually agreed upon (continued)**

*restricting pastures and hunting and fishing areas. These restrictions are still not complete throughout the world.*

*Somewhat later we saw that the commons as a place for waste disposal would also have to be abandoned. Restrictions on the disposal of domestic sewage are widely accepted in the Western world; we are still struggling to close the commons to pollution by automobiles, factories, insecticide sprayers, fertilizing operations, and atomic energy installations.*

*In a still more embryonic state is our recognition of the evils of the commons in matters of pleasure. There is almost no restriction on the propagation of sound waves in the public medium. The shopping public is assaulted with mindless music, without its consent. Our government is paying out billions of dollars to create supersonic transport which will disturb 50,000 people for every one person who is whisked from coast to coast 3 hours faster. Advertisers muddy the airwaves of radio and television and pollute the view of travelers. We are a long way from outlawing the commons in matters of pleasure. Is this because our Puritan inheritance makes us view pleasure as*

*something of a sin, and pain (that is, the pollution of advertising) as the sign of virtue?*

*Every new enclosure of the commons involves the infringement of somebody's personal liberty. Infringements made in the distant past are accepted because no contemporary complains of a loss. It is the newly proposed infringements that we vigorously oppose; cries of 'rights' and 'freedom' fill the air. But what does 'freedom' mean? When men mutually agreed to pass laws against robbing, mankind became more free, not less so. Individuals locked into the logic of the commons are free only to bring on universal ruin once they see the necessity of mutual coercion, they become free to pursue other goals. I believe it was Hegel who said, 'Freedom is the recognition of necessity'. (p. 1248, Hardin, 1968).*

#### Mutual Coercion Mutually Agreed upon

*The only kind of coercion I recommend is mutual coercion, mutually agreed upon by the majority of the people affected. To say that we mutually agree to coercion is not to say that we are required to enjoy it, or even to pretend we enjoy it. (p. 1247, Hardin, 1968)*

However, if individuals pursuing their own self-interest (euphemism for greed) knowingly overexploit the commons for individual gain, then this irrational, intemperate behavior brings ruin to all. If individual communities or neighboring communities in the region choose not to exercise constraint, then external coercion may be needed for survival of all. As Edmund Burke (1791) stated, "It is ordained in the eternal constitution of things, that men of intemperate minds cannot be free. Their passions forge their fetters." (see **Box 4**).



**Box 4.** *Civil liberty and justice.*  
(from Edmund Burke letter, 1791).

“Men are qualified for civil liberty in exact proportion to their disposition to put moral chains on their appetites; in proportion as their love of justice is above their rapacity; in proportion as their soundness and sobriety of understanding is above their vanity and presumption; in proportion as they are more disposed to listen to the counsels of the wise and good, in preference to the flattery of knaves. Society cannot exist unless a controlling power upon the will and appetite be placed somewhere, and the less of it there is within, the more there must be without. It is ordained in the eternal constitution of things, that men of intemperate minds cannot be free. Their passions forge their fetters.”

## PAYMENTS FOR ECOSYSTEM SERVICES

Nature is a living system that runs on solar energy sustaining life on Earth. Nature provides ecosystem services, such as fresh water delivery, soil formation, air purification, organic waste decomposition and recycling, detoxification, aesthetic beauty and spirituality, free of charge. Why is there need to pay for these heretofore free services? Are not ecosystem services protected by local, state, regional, national, and international laws and enforced compliance? Should we even consider ecosystem services in economic terms?

These questions arise from a fundamental concern for protecting and preserving our naturally endowed planetary life support systems, or natural capital. Essentially, in the Western or dominant society’s fixation with economics, payment for ecosystem services is an economic mechanism to solve the problem. In oversimplifying brevity, affluent users or beneficiaries of ecosystem services, who reside largely in urban areas “downstream” and enjoy fresh water, clean air, wildlife and biodiversity, recreational amenities, carbon capture and storage, and food produced from rural areas “upstream”, pay economically challenged providers residing in the hinterlands to maintain forests, watersheds, and foodsheds.

The rural suppliers make “sustainable PES products” or “natural capital” available to downstream users via a negotiated payment for conservation efforts that are less expensive to urban users than city-based alternatives such as constructing and operating costly water purification facilities. Concurrently, the conservation payment is designed to preclude land use degradation, protect natural ecosystems, and to restore or rehabilitate damaged ecosystems while providing an economic incentive beyond what limited income the rural people might have otherwise generated from other land uses. Payments for ecosystem services from urban users to rural providers result in a win-win economic result designed to meet needs of both sets of parties (see explanatory Principles of Payments for Ecosystem Services illustrated in **Box 5**).

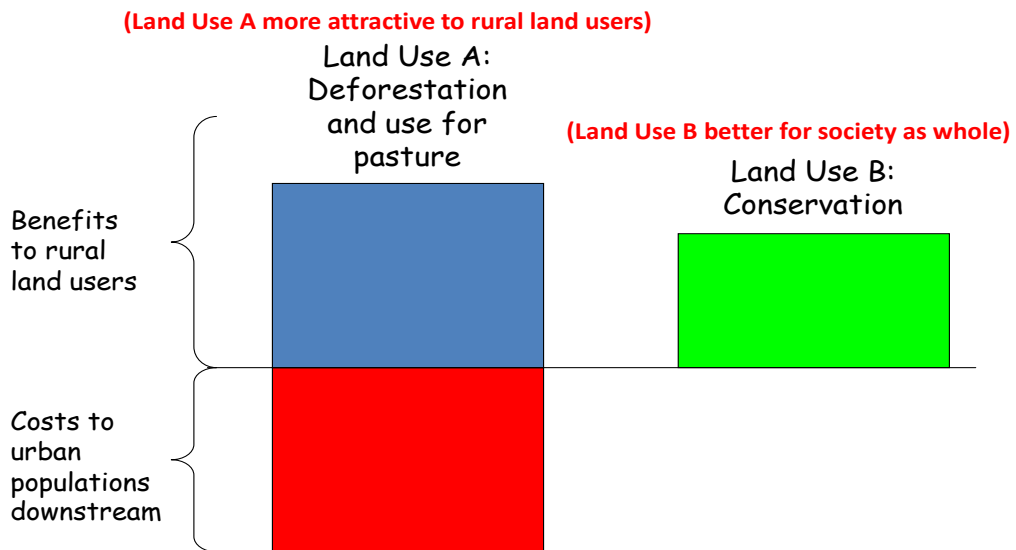
**Box 5. Principles of Payments for Ecosystem Services**  
(from The World Bank, 2010)

## 1. PES Primer—Fundamentals

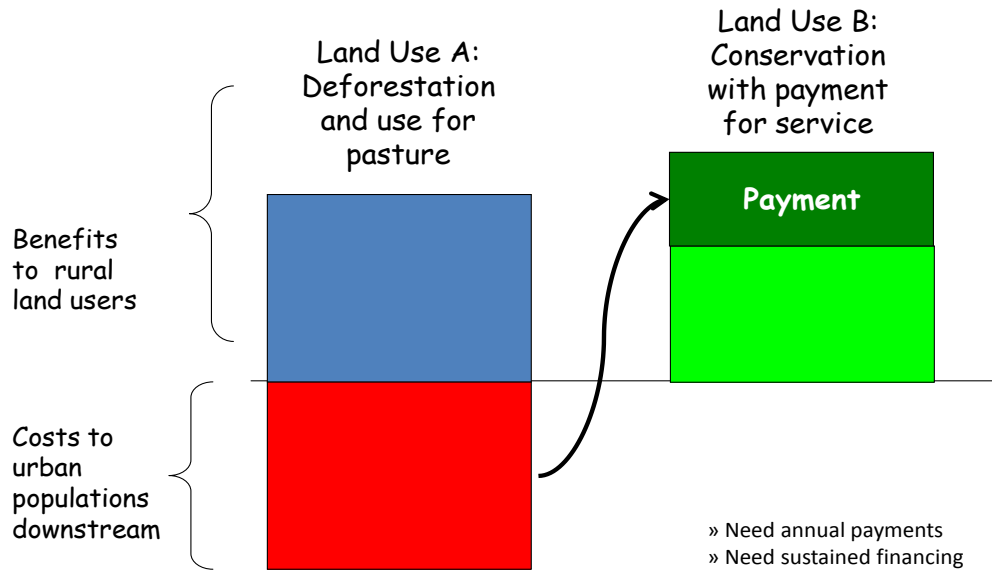
- **(‘Provider gets’)** Those who provide environmental services get paid for doing so.
- **(‘User pays’)** Those who benefit from environmental services pay for their provision.
- **Efficient:**
  - Conserves what is worth conserving
  - Does not conserve what is not worth conserving
- **Potentially very sustainable:**
  - Not based on whims of donors, NGOs, but self-interest of service users and providers
  - Need for water, biodiversity, carbon won’t go away, so can generate indefinite payment stream
- **For PES to work, need:**
  - Base payments to providers on payments by users
  - To actually deliver services: getting the science right is critical
  - Taylor mechanism to specific local conditions

**Box 5. Principles of Payments for Ecosystem Services (continued)**

## 2. What problem is PES addressing?



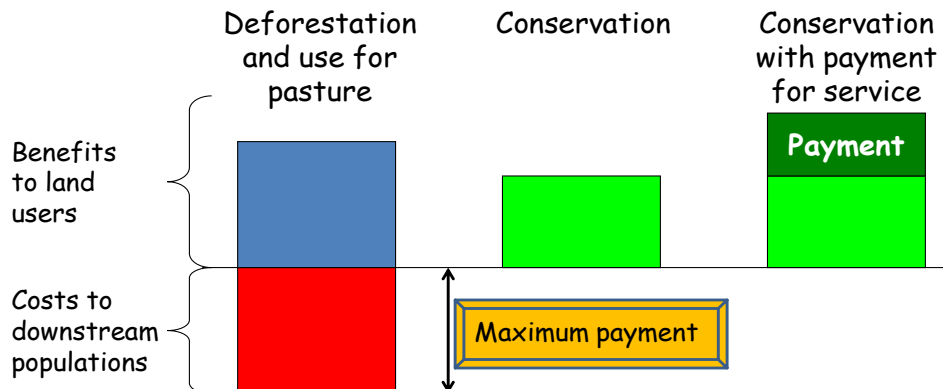
### 3. How does PES work?



### 4. Charging service users

How much should beneficiaries pay?

- Maximum: value of the benefit

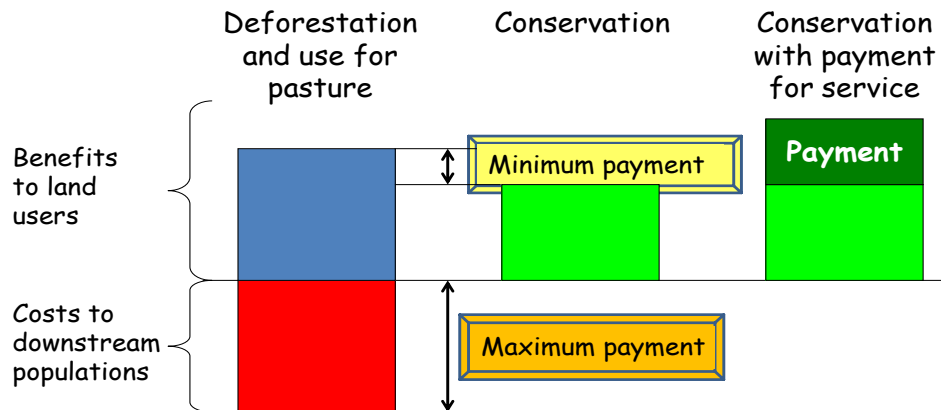


Box 5. Principles of Payments for Ecosystem Services (continued)

## 5. Valuing PES services

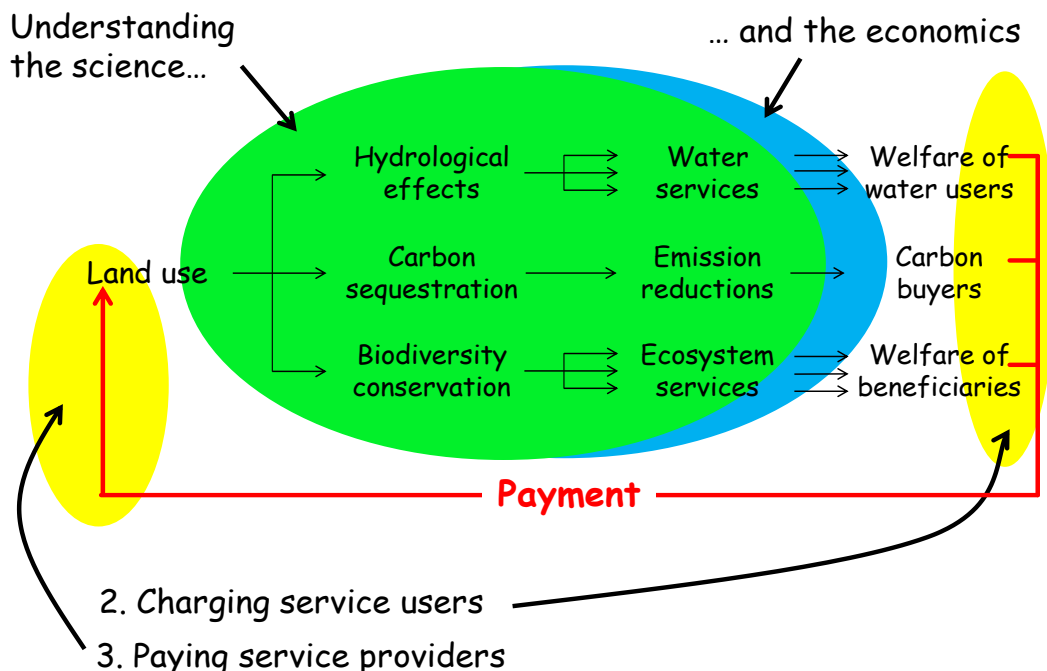
Why value?

- Value of benefits (maximum payment)
- Opportunity cost (minimum payment)



Box 5. Principles of Payments for Ecosystem Services (continued)

## 6. PES from theory to practice



*PES example—hydrological services from New York City watershed*

New York City is supplied with fresh water from primarily surface water via a system of 19 reservoirs and three controlled lakes within a watershed spanning 2,000 square miles in parts of eight upstate counties towards the Catskill Mountains (see map from Principe, 2005). With a system capacity of 550,000 million gallons, it provides 1,400 million gallons of water daily to over 9 million residents of New York City, representing half of New York State's population. It is maintained and operated by the NYC Department of Environmental Protection. Water consumption decreased by nearly one-third since 1980s due to conservation promotion and increased awareness of NYC water users (Principe, 2005).



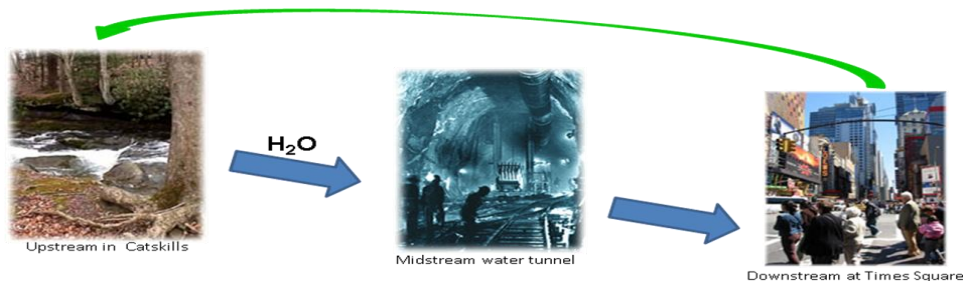
The US Environmental Protection Agency required filtration for New York City water coming from the densely populated and highly developed Croton watershed by 2007. This filtration system was estimated to cost US\$2,000 million. A Filtration Avoidance Determination waiver was granted, however, for water originating from the Catskill/Delaware watershed, which is more rural with forests and dairy farms. By investing US\$2,000 million upstream for watershed management and protection

measures associated with the USEPA waiver, New Yorkers avoided as much as US\$8,000 million water treatment downstream in the City (Principe, 2005). The types of watershed programs financed by NYC included protection options and remediation options. Protection options were designed to prevent future degradation of water quality that were large scale and evaluated over the long-term (e.g., storm water controls, sewer extensions, septic system rehabilitation, stream corridor protection). Remediation options addressed specific problems and were expected to result in measurable decreases in pollutants that were small scale and evaluated over the short-term (e.g., watershed rules and regulations, land acquisition, agricultural programs, forestry management) (Principe, 2005).

As an example of an upstream NYC hydrological services provider, Harold Grommeck and his family operate Grommeck Acres. The Grommecks manage a herd of 115 milking cows and 90 young stock in the Town of Andes. Like many dairy farms in this region the barnyard is located very close to a stream and during high runoff events the barnyard is often flooded. Watershed Agricultural Program (WAP) planning staff worked with the farm family to develop a whole farm plan that addressed all the water quality issues on the farm. The work around this barnyard brought in resources from several different sources including the WAP, USDA Conservation Reserve Enhancement Program (CREP) and the O'Connor Foundation Farm Beautification Program. The concrete barnyard and associated runoff management work was paid for by WAP, the culvert crossing and other associated BMPs to establish 7 acres of riparian buffers was installed through CREP and the improvements to the barn itself were paid partly through a grant from the O'Connor Foundation (Principe, 2005, including photos).

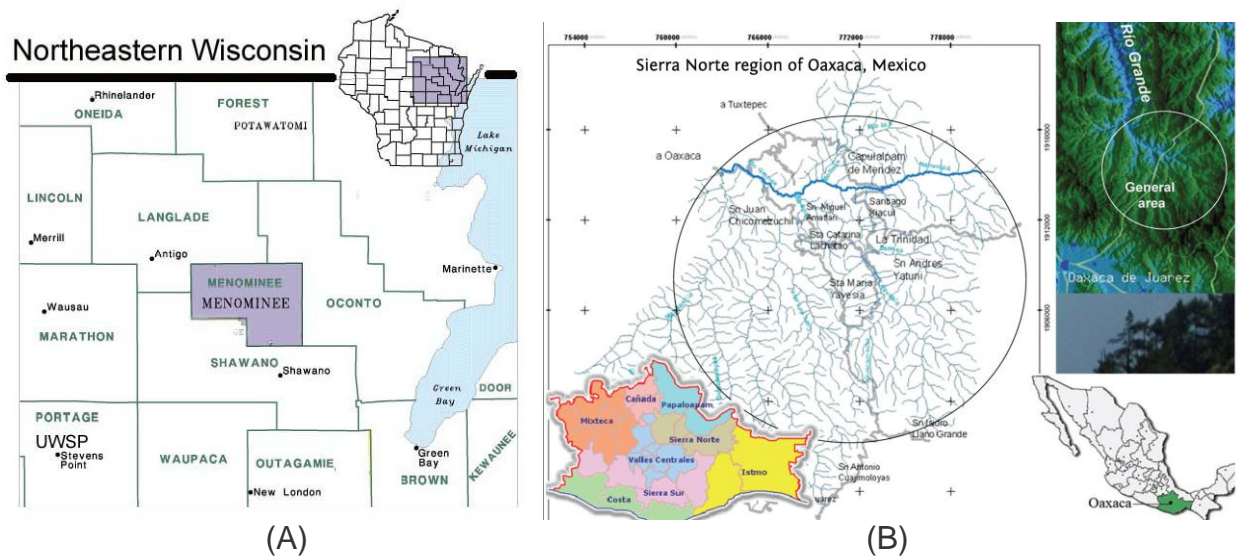


This successful hydrological PES project confirmed New York City's belief that reliance on end-of-pipe solutions alone is not prudent; best approach is to protect quality of water at its source (Principe, 2005).



*PES example—carbon sequestration and valuation in indigenous community forests of Zapotecs in Oaxaca, Mexico and Menominee Nation in Wisconsin, USA*

Recently GEM completed a 5-year study on carbon sequestration and valuation potential of community forests and tribal forests in San Andrés Yatuni in the Sierra Norte, Oaxaca, Mexico and on reservation lands of the Menominee Nation in Wisconsin (from Phillips, 2010; see maps below). The indigenous Zapotec and Menominee people manage primarily for healthy natural forests with selective harvesting for some economic return and low-impact gathering, hunting, and other cultural uses. Hopefully, this attention to maintaining healthy natural forests may eventually be recognized and valued in new, post-Kyoto international agreements related to payments for ecosystem services (see graphic at end of section from Phillips, 2010). This example represents feasibility assessment of payments for ecosystem services of carbon offsets.



Study sites: (A) Menominee County/Reservation, Wisconsin and (B) San Andrés Yatuni in the Sierra Norte, Oaxaca.

*San Andrés Yatuni community forests*

In Mexico, indigenous Zapotec leaders and natural resource managers of San Andrés Yatuni expressed a need for information on the feasibility of potential future payments for ecosystem services and/or carbon offset credits. San Andrés Yatuni forest and land use change data collection activities were implemented to obtain basic inputs for evaluation using an analytical model developed specifically for projecting both baseline (“without project”) and active forest management for carbon sequestration and valuation for potential carbon credit payment (“with project”) scenarios.

Preliminary results developed by GEM partners in Mexico (Estudios Rurales y Asesoría Campesina, A.C. and Instituto Tecnológico de Estudios Superiores de Monterrey) identified the community’s planned reforestation of 50 hectares in San Andrés Yatuni as

a realistic activity to obtain carbon payments. The comparison of estimates for both “without project” and “with project” scenarios revealed an additionality of 6,160 tons of CO<sub>2</sub> equivalent within a period of 30 years. This amount of additional carbon sequestered is the result of 50 hectares of forest recovered through reforestation and enhancing natural regeneration. Considering a market price of US\$ 7 per ton of CO<sub>2</sub> equivalent (at the time of the analysis in 2008), the amount sequestered would represent new income of only US\$43,120 over the 30-year period, with an annual average of US\$1,540.

The above analysis was performed during the height of carbon trading prices in 2008 when the Chicago Climate Exchange carbon trading prices peaked at over US\$7 per ton of CO<sub>2</sub> equivalent. In April 2010 the CCX and the European Climate Exchange were purchased by Intercontinental Exchange, Inc., when current carbon trading prices were around US\$0.10 per ton due to stalled USA. cap and trade legislation and market uncertainty (Kirkland, 2010). In Europe, according to the European Climate Exchange/ICE website <http://www.ecx.eu> carbon prices are currently almost €16 per ton or approximately US\$20 per ton under the European Union’s Emission Trading System of mandated caps per Kyoto agreements (ECX, 2010).

In the void of federal policy on carbon trading in the USA, regional greenhouse gas initiatives have emerged with mandated cap and trade systems, e.g. the Regional Greenhouse Gas Initiative (RGGI) of Northeastern and Mid-Atlantic states (carbon trading prices currently under US\$2 per ton), and both the Midwestern Greenhouse Gas Reduction Accord of Midwestern U.S. states and Canadian Manitoba province (MGGRA, 2010) and the Western Climate Initiative of Western U.S. states and Canadian provinces (WCI, 2010) are slated to offer their first carbon trading auctions in 2012. Therefore, especially in U.S. voluntary carbon markets until the “cap and trade” issues and post-Kyoto GHG geopolitics are settled at the federal level, including REDD-plus considerations, further analyses are advisable in light of the current uncertainty and volatility (Phillips, 2010).

In light of the meager payment potential, the recommendation to San Andrés Yatuni leaders was to consider inviting neighboring Zapotec communities to join with them in a wider project with greater potential to achieve a cost-effective total amount of carbon offsets. This partnering strategy could increase feasibility for greater financial return (with concurrent social and ecological benefits, too). Furthermore, it is advisable to explore possibilities via post-Kyoto REDD or REDD-plus schemes that this community and others in the region might access, with clear measures preserving rights and privileges of the Zapotec people. Under such policy schemes that value existing healthy and sustainably managed natural forests, it is probable that the financial feasibility of the San Andrés Yatuni project could improve significantly. A variety of market categories are available for consideration by the local Zapotec leaders:

- International agreements, such as Kyoto Protocol, and post-Kyoto policies making eligible for carbon credits natural forest ecosystems and other land uses for conservation such as those emerging from REDD and REDD-plus schemes.



- Governmental programs of payment to owners for maintaining or increasing the quality and quantity of environmental services such as CONAFOR's (National Forest Commission of Mexico) Proarbol program for payments for ecosystem services, which promotes the conservation of natural areas contributing to forest ecosystem improvement by carbon capture, conservation of biodiversity, hydrological services, natural regeneration in areas damaged by meteorological impacts, and agroforestry systems.
- Cap and trade for emissions, where an authority sets a limit on the amount of a pollutant that can be emitted. Companies that need to increase their emission allowance must buy credits from those who pollute less. In effect, the buyer is paying a charge for polluting, while the seller is being rewarded for having reduced emissions by more than was needed.
- Local and private markets with direct agreement between consumers and land owners in general.
- Eco-labeling is a means to certify that a product was grown, harvested, and processed in a sustainable, environmentally sound way.
- Adaptive forest management strategy can be deployed to achieve integrated, sustainable land use for healthy watersheds, biodiversity conservation, and carbon goals in a local project over the long-term.

### *Menominee tribal forests*

Having sufficient land for substantial carbon sequestration is not a constraint for the Menominee Nation, which has over 200,000 acres of forests on its Reservation in northeastern Wisconsin. The Menominee Tribal Enterprises manages the Menominee forests and operates a sawmill on a sustained-yield basis. Culturally, the forests are ancestors that sustain the Menominee people. As such, great care of and respect for the forests are practiced, and the economic value, while important, is secondary to the spiritual and holistic nature of the Menominee forests as a living continuum. So, the indigenous perspective of the Menominee in this study reflects a strong concern for maintaining forest health in perpetuity as opposed to any short-term financial gain through carbon markets.

The carbon sequestration value of the Menominee tribal forests is substantial. Using the Northern Hardwoods (sugar maple with associated beech, American elm, basswood, yellow birch and others) forest type data presented by Menominee Tribal Enterprises (2009), GEM summarized preliminary carbon sequestration and valuation estimates for the Menominee Forest. The preliminary results of this analysis were:


- Carbon sequestered annually by Northern Hardwoods forest cover type = 238,416 MT CO<sub>2</sub> equivalent/yr [3.45 MT CO<sub>2</sub> equivalent/ac/yr X 69,106 ac]
- Carbon sequestered for 15 years on Menominee Reservation by Northern Hardwoods forest cover type = 3,576,240 MT CO<sub>2</sub> equivalent [238,416 MT CO<sub>2</sub> equivalent/yr X 15 yrs] (Phillips, 2010).

By extrapolation to the entirety of the Menominee Forest, roughly three times as much carbon could be sequestered (as the other forest types represent approximately 2/3 of


total acreage of Menominee Forest). An approximate extrapolation for the Menominee Forest, then, is over 10 million MT CO<sub>2</sub> equivalent over a 15-year period. For valuation estimates calculated at a conservative US\$ 1 per MT CO<sub>2</sub> equivalent, the Northern Hardwoods forest cover type an estimate of US\$238,416/yr is derived; over a 15-year period amount comes to US\$3,576,240. If the entirety of the Menominee Forest were to be deployed for carbon sequestration, then a tripling of these amounts is estimated, i.e., US\$715,248 annually or more than US\$10 million over 15 years (Phillips, 2010).

Of course, the Menominee Tribal Enterprises manages forests for many purposes and cultural values of the Menominee People—not simply for carbon credits—and carbon sequestration rates and carbon markets will change through time. The above estimates are offered as a rough, preliminary attempt at framing of possibilities for discussion. It is expected that a more rigorous analysis by the Menominee Tribal Enterprises using its knowledge, expertise and data will result in substantially greater economic return estimates. Values other than economic are important in decision making by Menominee leaders, who will balance other considerations ultimately in determining whether to pursue carbon payments or not.

**Irony to be addressed in carbon offset policy & practice**





Poor Forestry Management Operation



Good Forestry Management Operation

Lots of room for improvement





Yatuni & Menominee forests

Little room for improvement

**Strategy 1:**

- High-grades/clear-cuts marketable timber.
- Plants quick cash crop that exhausts soil.
- Causes unsustainable degradation.

**Strategy 2:**

- Manages for healthy, productive forest with multiple benefits.
- Promotes long-term sustainability.

***Per Kyoto Protocol, only reforestation & afforestation operations are eligible to receive carbon payments***

*Who has greater potential for PES carbon payments?*

The Poor Forestry Management Operation exploitatively degrading landscape, or  
The Good Forestry Management Operation creating secure & sustainable future?

Victor Phillips, June 2007

Shortcoming of Kyoto Protocol: Good forest management of existing natural forest stands is not eligible for carbon payments (thus the need for REDD-plus and other mechanisms that address this policy shortcoming). Source: Phillips, 2010.

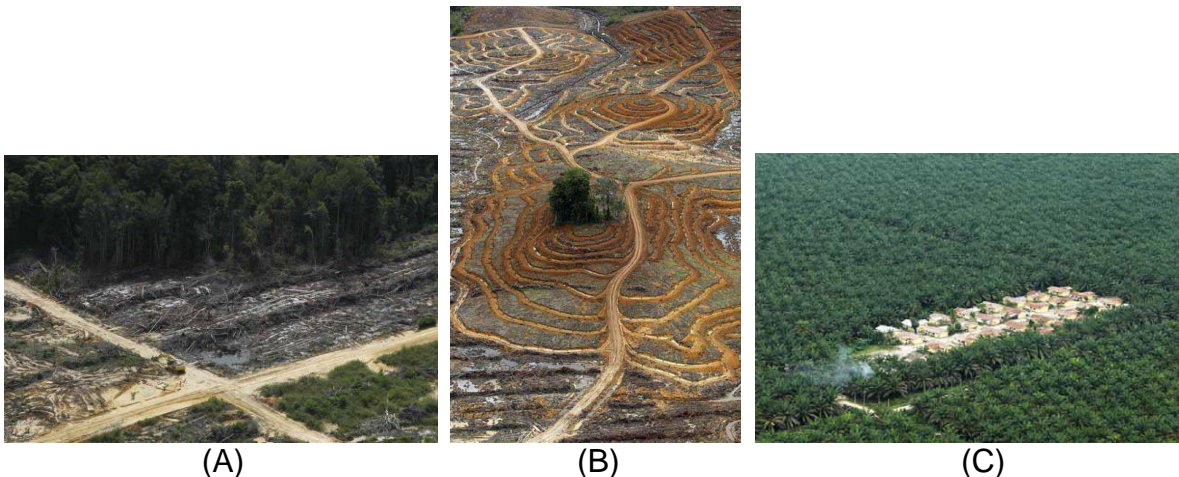
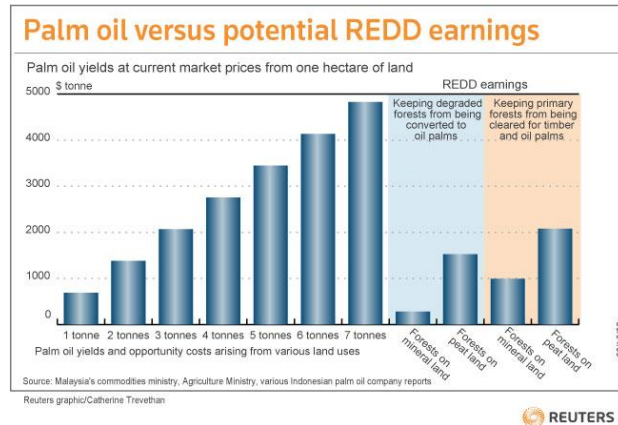
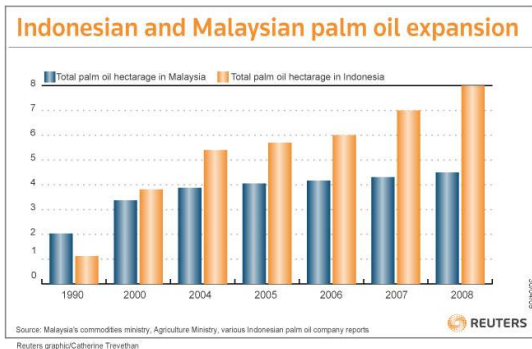
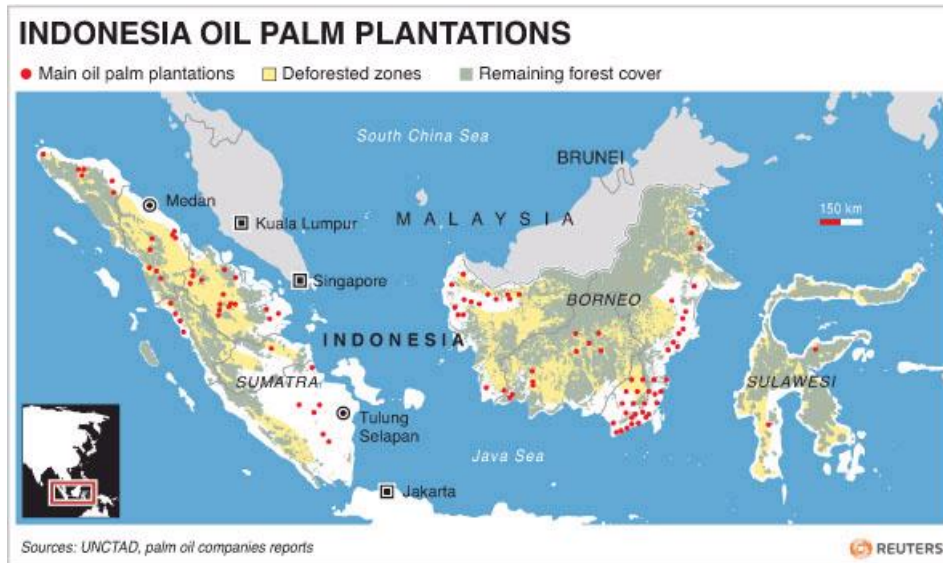
*PES challenge—REDD hot palm oil plantations displacing native peat swamp forests in Indonesia*

While working on the island of Borneo at Universiti Malaysia Sarawak in Kota Samarahan in the mid-1990s, I completed a review paper on peat swamp ecology and sustainable development on Borneo, which included a call for a moratorium on peat swamp land development in important commons there (see Phillips, 1998). After a decade of accelerated peat swamp forest clear-cutting for palm oil plantations, *National Geographic* published “Borneo’s Moment of Truth” by Mel White (2008). A few years later in the spring 2010, the GEM “Critical Issues” International Seminar series hosted a panel of forestry experts from Indonesia for a public presentation and discussion of “Protecting Jobs and the Environment: Addressing illegal logging and deforestation (see GEM website: <http://www.uwsp.edu/cnr/gem/CriticalIssuesSeminar/0910CIS.html>). This challenging PES example from Indonesia impinges upon hydrological services, carbon uptake and storage, as well as biodiversity conservation concurrently. It underscores the difficulty in reconciling big money palm oil production with small money PES payments when an economic model predominantly defines the future.

Current international debate to expand forest conservation and protect against land use change from other natural land cover to address global warming is formulated as Reducing Emissions from Deforestation and Forest Degradation (REDD). REDD began with the realization that reducing greenhouse gas emissions by mitigating deforestation (RED) was an urgent issue to reduce negative land use changes globally. Subsequently, forest degradation was added (REDD), followed by including options to enhance positive land use changes through increasing forest carbon uptake and storage by forest restoration and rehabilitation (REDD+). Currently, yet further considerations for positive land use changes (REDD++) are being explored to integrate REDD+ actions with agriculture, forestry and other land uses (AFOLU) into a REDD++ or Reducing Emissions from Any Land Use (REALU) framework (Lasco, 2010; Van Noordwijk and Minang, 2009). REDD++/REALU spans or embraces all land uses. In such policy and practice considerations, it is important to recognize indigenous cultural and place-based rights and attributes.

As a glimpse at the PES challenge in implementing successful REDD++/REALU projects, the current controversy of “REDD-hot “ palm oil plantations replacing native peat swamp forests in Indonesia are disturbingly instructive. A map (see below from Webb, 2010) depicts the main palm oil plantations and deforested areas of Indonesia. Photos (see below from Webb, 2010) and graphs (see below from Koswanage and Bhui, 2009) illustrate the rapid replacement of land in natural forests with palm oil plantations (in millions of hectares) in both Malaysia and Indonesia over the most recent two decades, as well as contrast in palm oil versus REDD earnings.

Palm oil represents a major export crop from Indonesia and Malaysia—the world’s top two palm oil producers respectively—bringing in revenues of over US\$30,000 million annually. Selling at around US\$1,000 per metric tonne, up to roughly 7 tonnes palm oil are produced per hectare of oil palm plantation. Even at a lower production rate



(A) An aerial view of a cleared forest area under development for palm oil plantations in Indonesia's central Kalimantan province July 6, 2010. The photograph was taken as part of a media trip organised by conservationist group Greenpeace, which has campaigned against palm oil expansion in forested areas in Indonesia. REUTERS/Crack Palinggi. (B) An aerial view of a cleared forest area under development for palm oil plantations in Indonesia's central Kalimantan province July 6, 2010. REUTERS/Crack Palinggi. (C) An aerial view shows workers' lodgings at a palm oil plantation in Indonesia's Jambi province August 5, 2010. REUTERS/Beawiharta. (Source of oil palm estate photos: Webb, 2010)

it is easy for palm oil plantation producers to recoup their initial investment of US\$22,000 per hectare for land clearing, planting and maintenance, infrastructure and processing facilities establishment, harvesting, transporting and processing, and then realize large profits (Koswanage and Bhui, 2009).

A proposed REDD scheme by the United Nations to slow deforestation would pay countries that preserve forests up to US\$2,077.50 per hectare (Koswanage and Bhui, 2009). Compared to the US\$5,000 per hectare for palm oil, REDD is not economically viable. Because REDD credits are available via discounted voluntary markets (e.g., the Chicago Climate Exchange), prices of US\$1.50 per tonne of CO<sub>2</sub> are less than 80 percent of benchmark European carbon prices of €13.61 (US\$17.74) (Koswanage and Bhui, 2009).

As of 2008, over 15 percent of oil palm plantations in Malaysia and 25 percent of oil palm plantations in Indonesia (with more than 50 percent of new palm oil concessions in Indonesia) were established on former peat swamp forest lands (WRM, 2008). With 88 million hectares of forests remaining, Indonesia allowed the second largest net loss of forest cover during 2000-2005 at 1.5 million hectares annually. Deforestation has accelerated as Indonesia's oil palm planters and foreign firms expanded estates during a two-year price rally from 2007, which more than doubled the expansion rate of oil palm plantations to 1 million hectares annually (Koswanage and Bhui, 2009).

In 2010, Indonesia has approximately 8 million hectares in palm oil plantations. To realize a national production goal of 40 million tonnes of palm oil by 2020, an expansion of an additional 5 million hectares is anticipated (Gingold, 2010). A two-year moratorium on permits for clearing natural forest for palm oil plantations is being considered by the Indonesian government to begin in 2011, with an investment of US\$1,000 million from Norway to reduce deforestation thus helping to mitigate greenhouse gas emissions (Webb, 2010). Until the value of natural capital—and not just economic value—is recognized, respected, and enforced by “mutual coercion mutually agreed up” or by “spaceship Earth controls” exerted for survival of all, deforestation and land degradation practices are likely to continue in Indonesia and elsewhere.

## CONCLUSION

Payments for ecosystem services are a temporary fix—a transitional bridge over troubled waters of irrational self-interest that is systematically destroying the life support systems of the planet. As increasing awareness and alarm grow, strident clarion calls are repeated nowadays to protect and preserve Nature and to restore the world's commons for the common good and survival of all life forms on Earth. Increasingly, some are listening and taking up the call to act rationally. Until a time of rational behavior is widely embraced and made possible through “mutual coercion mutually agreed upon” or “external control” the commons remain besieged and in peril.

The notion exists that a lack of responsibility in taking care of the commons stems from lack of private ownership in land tenure. Yet without private ownership indigenous peoples for millennia who respect Nature's ways revering Mother Earth co-existed without destroying the means of their survival—the commons. The Western notion of land ownership may be an inherent weakness in payments for ecosystem services as a Western conception for protecting Nature's life support systems. A temporary band-aid for this weakness in the short term may be served by well-intentioned non-governmental organizations, private volunteer organizations, or other local citizen groups emerging to serve as de facto "owners" looking after the commons in the Western mindset. Ultimately, tribal lessons learned in humility and respect for Nature's ways hold much promise for the behavioral change required.

Our misguided and destructive disconnection with nature during the Industrial Revolution has imperiled us, but this deadly approach is being exposed and rejected. Previously, payments for ecosystem services to safeguard natural capital of integral parts of the Earth's commons were categorized into components such as:

- Hydrological services (fresh water);
- Carbon sequestration (global warming mitigation); and
- Biodiversity conservation (DNA blueprints for life and maintenance on spaceship Earth).

Currently, PES policy and practice efforts strive to transcend and integrate such components holistically, which is an important next step in transformative awareness and behavioral change (for excellent and comprehensive studies and helpful reviews see Daly and Matson, 2008; Goldman, 2010; Jack, Kousky, and Sims, 2008; Tallis et al., 2009; The World Bank Group, 2010; World Wildlife Fund, 2010; Wunder, 2005). The Natural Step, Transition Towns, Global Ecovillage Network, Millennium Villages, and Permaculture illustrate the many grassroots actions emerging to regain and apply common sense behaviors re-connecting with nature.

I believe the way forward may best be led and informed by indigenous peoples of our planet. As the wisdom keepers of knowledge and spirituality of nature's way, their cultural lessons learned since the inception of their place-based origins are vitally important for local healing, restoration, and preservation of the commons of the world. A deep respect and gratitude for their knowledge and help is long past due.

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