Biodiversity and Global Public Goods

1. The nature of benefits from biodiversity

Species biodiversity is one part of an inter-dependant web of complex interactions. Living creatures depend on one another as well as abiotic resources as part of its life source. This variety of life on earth is called biodiversity. First coined a term by the National Research Council (Wilson, 1997), biodiversity is short for biological diversity and is considered to be the "variability among living organisms from all sources…and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems" (UN 1992, art. 2, para.1). Often biodiversity is broken down into smaller categories including ecosystems, species and genes. An ecosystem is defined as the "local community of species organisms plus their physical environment" (Wilson, 1997). Because of this delicate interaction between species and the environment, an ecosystem is dependant on the endemic organisms that inhabit each particular area.

Throughout the world there is a wealth of endemic species confined to distinct geographical regions that are identified as "hot spots". The Choco Darien in western Ecuador, central Chile, and Madagascar are a few examples (Figure 1). Hot spots are classified as individual ecosystems or an aggregate of ecosystems with exogenous threats to endemic species. Collectively, these hotspots contain 44% of all plant species, 35% of all terrestrial vertebrate species and only encompass 1.4% of the earth's land (Conservation International, 2003). The hot spots are examples of some of the few remaining areas that are being protected for its biodiversity.

Species diversification is important for several reasons. It helps to ensure that an ecosystem, such as a watershed, is more resilient to natural and human-made disturbances such as floods, droughts and pollution. It helps to maintain certain cultural traditions, subsistence, transportation and religions of Amazon tribes in Ecuador which are reliant on flora and fauna diversity. Lastly, the loss of biodiversity will have profound impacts affecting the livelihood of farmers, environmental quality, food production networks, and the global economic marketplace. For a variety of reasons, biodiversity is a public good that should be conserved on a global level through policy management, global institutions, and civic participation.

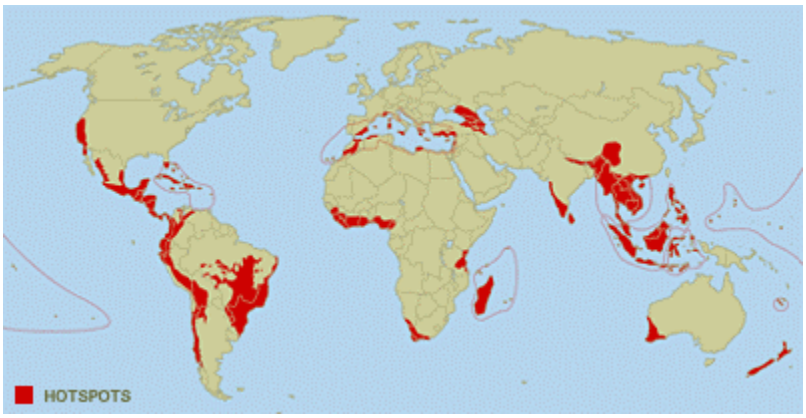

Figure 1. Global Biodiversity Hotspots
Source: www.conservation.org/xp/CIWEB/strategies/hotspots/hotspots.xml

2. Defining public goods

Defining public goods is often a difficult task. A general definition of a public good can be described as goods that are non-excludable and non-rival. Non-excludable means that an individual or a group of people can use a good, such as light from a lighthouse, without excluding others from using it just as much; this differs from private goods where people have legal rights to the exclusive use of a good such as a car. Non-rival goods, such as national defense,

can be utilized by an individual without reducing the availability or quality of the good for another person.

However, a limitation of this definition is that not all goods fit into these strict categories. One reason for this discrepancy is that society can manipulate how goods are used based on policy choices. For example, education can be considered both a private and public good. Because of this type of crossover, we can conclude that some categories of goods do not have to be exclusively private or public, but rather are dependant on public policy, social choice, or a combination of both to make that decision (Kaul and Mendoza, 2003). For this reason Kaul and Mendoza have considered defining public goods according to a public or private *domain*. Public and private goods fit into either one of these domains and can further be defined by their ability to be rival or non-rival, excludable or non-excludable.

3. Market failures

The efficient allocation of public goods is problematic and becomes increasingly difficult when considering intergenerational equity. The central theorem of modern welfare economics postulates that given certain strong assumptions the equilibrium conditions of the competitive markets will correspond to the requirements of Pareto efficiency (Bator, 35). From a neo-classical economic perspective, the market system efficiently allocates goods and services so that no one person (or group) is made better off without making another person worse off (Daly and Farley, 2003). However, the market system cannot efficiently market public goods that are not privately owned. The nature of public goods implies use by anyone regardless of whether they pay for the good. For these reasons, public goods are not considered to be Pareto efficient. So by deduction, public goods could not be marketed efficiently because no one person is worse off when another person is better off.

As an alternative, economists try to assign monetary values to natural resources, such as biodiversity, with the intention that the free market will distribute them efficiently. An example of this type of valuation process is the willingness of individuals to pay for public goods. The "willingness to pay reflects the maximum monetary amount that an individual would pay to obtain a good" (Brown and Gregory, 1999). In this case, the market assumes that the sum of the individual's willingness to pay will reflect the willingness, in dollars, of society to pay for a non-market good. The willingness to pay concept is widely used to provide information used in public policies regarding the economic value of an environmental asset.

For example, if we added up the amount that individuals would be willing to pay for a view of Lake Champlain then we would assume that the sum of individual's willingness to pay divided by the number of persons viewing the lake is the average amount each individual would pay for the public good. But the reality is that only some people will pay for a view while others assume that someone else will pay, or that you shouldn't have to pay at all. The non-excludable nature of certain public goods, such as a view of Lake Champlain, will necessarily result in the free-rider effect; where people will depend on others to pay for their contribution. Furthermore, if people feel that the cost of a public good will be based on their willingness to pay, they will underestimate the cost. We can also assume that a large majority of the population is ignorant about how to value ecosystem services such as biodiversity and will in-turn undervalue the asset. This means that we cannot adequately value a good based on the opinions of the public and the marginal cost will vary (Kaul et al., 2003).

The privatization of public goods has been proposed as another option for regulating the allocation and distribution of a public good. The specious nature of this concept however may prove to be more flawed than private governance under the free market system. This concept seems to be contradictory to the notion of public goods and individuals rights of access to these resources.

Governments desire to privatize public goods in the hope of a more efficient allocation of goods and services by private owners. This process may provide an infusion of new capital, management and technology which can further enhance efficiency and production. However, this may lead to an increase in public exclusion from policy and management decisions regarding ownership and control of the resource (World Resources Institute, 2003). Furthermore, private companies tend to disregard the social, cultural, and environmental benefits of public goods such as providing potable water to impoverished communities or preserving rainforest species that benefit indigenous tribes.

Cochabamba Bolivia is a primary example of an impoverished region where chronic water shortages were and still are a major problem. Although local cooperatives managed wells, the World Bank seized the opportunity to privatize the water system. In 1999, the Bolivian government conducted an auction of the Cochabamba water system. Foreign firms bought the industrial, agricultural, and residential water rights with a long term commitment. Because of new laws set by the Bolivian government, these firms were able to install meters and begin charging monthly rates as high as a quarter of an ordinary workers income. Outraged citizens organized public meetings which led to protests, demonstrations and violence. In the end, the contract was revoked and the water rights were returned to the local people. Now, the World Bank requires all of their client governments to submit a "poverty reduction strategy" (Finnegan, 2002). When Finnegan asked an official at the World Bank about the situation, they suggested that, "those Indians needed to learn to use more water".

4. Biodiversity as a global public good

As seen in this example, global public goods are difficult to efficiently allocate and equitably distribute as local public goods. Global public goods have

a similar definition to public goods but can be further defined by the beneficiaries of the good. This is an important concept to understand because "we live in a highly divided and inequitable world where some actors are more influential than others in setting public policy agendas and where some goods, even supposedly (global) public goods, are more easily accessible to some people than to others" (Kaul, et al, 9). Kaul et al. further explains that global public goods must meet the following distributional criteria: they must cover more than one group of countries; transcend socio-economic and political boundaries; and meet the needs of present generations without jeopardizing the future ones. In other words these goods are available to anyone, anywhere, at anytime.

The benefits of biodiversity can be observed on a global scale. However, questions remain regarding scale and jurisdiction of management. "Each state has the unrestricted and exclusive right to determine the management of the various natural resources that it 'hosts'" (Swanson, 1995). Yet, in the case of biodiversity loss, the problem extends beyond the scope of state boundaries and becomes a global issue. As Swanson states, the essence of the problem arises from the impacts of national resource exploitation on global biodiversity stocks. In many cases, the individual states are not concerned with the loss of biodiversity, but rather loan payments, and therefore do not or poorly regulate the protection of these areas.

5. Problem with global public goods

While it is difficult to manage national and local public goods, it is increasing complex on a global scale. Global public goods, such as biodiversity, cannot be accurately valued and lack efficient markets and management policies which are exacerbated by the limited number of institutions and lack of an international government. Likewise, it is extremely difficult to quantify the positive and negative externalities and benefits of biodiversity in economic

terms. Daly and Farley (2003) claim that an externality occurs when an activity or transaction by some parties causes an unintended loss or gain in welfare to another party, and no compensation in welfare occurs. An example is a cattle rancher who allows his cows to walk in a stream increasing the turbidity and fecal content. The downstream pollution can be considered a negative externality. If the same cattle rancher re-vegetates his riparian zone, reduces cattle crossing in the stream and thereby increases shade and fish habitat, the benefit is a positive externality. However, these externalities are difficult to measure on a local or global scale.

Commonly used valuation methods including the contingent valuation and cost-benefits analysis have limitations within the current market system and don't necessarily capture positive or negative externalities. Contingent valuation presents people with hypothetical situations and asks them how much they would value a particular good. For example, how much would you value 100 grizzly bears in Yellowstone National Park? This is a difficult question to answer. Similar to the willingness to pay problem, most people do not know how to adequately place a dollar amount on a natural resource. Cost-benefit analysis is comparable to the contingent valuation method in that people are trying to monetarily quantify subjective and objective variables. Valuing the difference between clear cut logging and thinning is an example of the comparison of costs and benefits required in this analysis. "If the importance of nature's free benefits could be adequately quantified in economic terms, then policy decisions would better reflect the values of ecosystem services and natural capital" (De Leo, 2000). Unfortunately, there is an important place for valuing goods on an economic level; however, these approaches can be both narrow and misleading.

Furthermore, unlike state or national governments, existing global institutions, such as World Bank or the IMF, lack the authority to create and enforce public policies, delegate ownership, monitor negative externalities, or

create implementable management strategies. The World Resources Institute claims that the common failures of organizations are due to three things. Organizations lack of coordination among, and between, resulting in competition for jurisdiction, budget and influence within the local government with little regard for management approaches. Second, due to a lack of accountability, organizations assume that environmental, social or cultural concerns are not part of their job and will be addressed by some other agency. Lastly, communication is limited between organizations and the general public regarding environmental policy decisions. Despite these failures, established institutions could collaborate on the allocation and distribution of biodiversity and other environmental goods and services (World Resources Institute, 2003a).

6. Management of global public goods

In order to manage global public goods, there must be an established framework for institutions; improved communication among governments, civilians, and non-governmental organizations; as well as a common understanding of the need for global public goods. International cooperation needs a global framework based on equity, justice, and willing participation (Rao, 1999). To date, existing institutions have yet to value these characteristics as part of a foundation for the protection of global public goods. With increased global participation of citizens and non-governmental organizations focused on these aforementioned qualities, we can begin a dialogue concerning the appropriate distribution of environmental benefits and positive externalities. Increasing the amount of interest and involvement of the global community, economy and policy, institutions will be required to create adequate policies to meet the demands of the people.

Moreover, the establishment of civic institutions and a global governance, where delegates from around the world discuss social, environmental and

economic issues, will increase public awareness and involvement. The World Resources Institute claims that public participation brings legitimacy, consequently improving the credibility and effectiveness of the decision-making process. Whereas failure to provide for public input can bring just the opposite: conflict and resistance. Involving the public is key to ensuring that government agencies and institutions are acting in the public interest and that environmental policies reflect public values. Society benefits from public participation by the improved quality of decisions, built trusts in institutions, and greater education and information for the public. Methods that have been used in the United States that could be potential models are: informational meetings on a local, state, or national level; environmental impact statements or assessments; public hearings; advisory committees; public role in implementation and monitoring; as well as document reviews. "One of the most direct routes to better environmental decisions is to provide easy access to environmental information and encourage broad participation (World Resources Institute, 2003a).

7. Policies

Policy can be used as an instrument to manage the provision of global public goods. The following is a synopsis of six design principles suggested by Daly and Farley (2003) that will help to promote a steady-state economy. The three main goals of ecological economics are sustainable scale, just distribution, and efficient allocation. In order to attain these three goals, we need to have three independent policies that meet the desirable goals versus trying to implement one policy that will inadequately address the three goals collectively. Given that biodiversity is a limited resource, there should be micro-control at a national level while maintaining global scale objectives. Furthermore, it is necessary to leave a buffer on the biophysical constraints so as to increase the safety margins between our demands the carrying capacity of biodiversity.

Equally important, is to transform current institutions with conservative policy tactics instead of radical changes. We must recognize our current and historical conditions leading up to the biodiversity problem and our long-term goals must proceed at a gradual pace. An adaptive management strategy is essential to this process. In order to learn from our mistakes, our policies must be able to adapt to the changing knowledge, methods and principles versus socially ideal but politically unrealistic policies (Daly and Farley, 2003).

In order to implement these ideas into our current market system, we must first shift our paradigm and recognize that our market system is a subset of the ecosystem. Natural resource scarcity is an issue that cannot be controlled by technology and substitution. Our market system will not achieve efficient allocation of resources until policies address the aforementioned principles and basic issues of just distribution and scale.

8. Conclusion

The provision of global public goods in relation to biodiversity is a difficult and esoteric concept. It combines a plethora of issues into one broad problem. Luckily, ecological economics connects our resources to the market system by recognizing the connection between resource extraction, depletion, pollution and resource allocation and equitable distribution. Establishing a framework for global institutions through policy management and increased communication has become a necessity. Without increasing public participation and incorporating social and environmental issues together with economic policies, this world will see the degradation of an important and essential natural resource.

I plan to continue working towards a viable solution to this problem through policy management, public involvement, and economic incentives. I will analyze projects that incorporate policy and economics with conservation

strategies. In particular, the ICMS ecological model from Parana, Brazil, uses the 'ecological' value-added tax as an economic incentive for municipalities and non-governmental organizations. This is a potential working model that can be expanded to include the management and provision of global public goods.