Vermont Common Assets Trust:
Proposal for Resource Inclusion

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Abstract

It has been made apparent that the conventional market system does not adequately allocate a variety of natural resources. Using price to determine resource distribution ignores biophysical limits and can generate market failures and inefficient resource allocation. To address this problem, the Vermont legislature is considering the creation of a Vermont Common Assets Trust (VCAT) that would make the state's atmosphere, biosphere, aquifers, and other common assets the common property of all Vermonters. A board of trustees appointed to the Trust, would manage the assets for the benefits of all Vermonters. The purpose of this paper is to present Vermont legislatures with renewable and non-renewable resources that can be taken into consideration for inclusion in the trust. Provided is criteria with which common assets should be determined to meet inclusion and appropriate mechanisms for inclusion. The criteria is based on reasons of justice, sustainability, and efficiency.

Introduction

The goal of the market is to produce enough goods and services that provide the economy with a vast range of choices (allowing actors to weigh cost and benefits) that maximize utility. Output has been propelled by capitalistic virtue (Dryzek, 1994) where productivity is achieved by putting available nature to productive use, harnessing its capabilities through human (available labor) and man-made capital (technology), is means to a desirable end (O'Connor, 1994).

Profit hungry behavior is based on the *homo economicus* assumption that humans are self-interested, independent actors pursuing resources that maximize their well-being. (Daly & Cobb 1989; Boulding n.d; Daly & Farley 2004; Ostrom et al. 1999). What the theory ignores, as Daly and Cobb (1989) point out, is *real* human behavior: people are concerned with the utility of others and individual satisfaction is based on their relative position in community. A desire for social status induces a race among individuals in order to achieve wealth primacy (Axelrod 1981). By choosing labor to generate wealth and a relatively higher position in society, they can then expend more to derive greater utility (Tournemaine & Tsoukis 2008).

It is widely observed that natural ecosystems are under enormous pressure around the world from the growing demands placed on them by human economies (Pagiola et al. 2004; Burkett 2003; Costanza et al. 2009; Daly 1992; Deleage 1994). What is increasingly clear is the

fact that natural resources are the limiting factor to production (e.g raw materials) - not human capital - and the ultimate factor determining human well-being (e.g ecosystem services that provide flood control) (Goodland 1992; Daly 1992, Daly & Farley 2004; Wackenagel & Rees 1997). The availability of drinkable water, available food, arable land, climate stability, and waste absorption capacity are just several of the many life-sustaining services of ecosystems' function. However, none of the services mentioned are marketable goods, that is, they have no monetary value and no current mechanism that establish them as so. The failure to recognize resources' values and ignore the limits to growth, augments the risk of a deteriorating quality of welfare (Pagiola et al. 2004). In the absence of the ecological-economic pastiche in the current market environment, little policy options are available to offer the full range of ecosystem service possibilities and management options, or allow for the determination of optimal production on a feasible scale (Farber et al., 2006). Continual imprudent pressure may irreversibly reduce carrying capacity and available resources for future generations (Arrow et al. 1995).

The conventional market fails to adequately allocate benefits such as wealth and land, or provide sufficient compensation from the negative externalities endured by one party from another's actions (e.g a foreign business man owns an industrial plant whose waste runs into a community's reservoir (Daly & Cobb 1989; Barnes 2006; Pagiola et al. 2004; Daly & Farley 2004). Peter Barnes (2006) argues, in *Capitalism 3.0*, that the current economic system of capitalism fails to recognize the value and manage the commons. The commons refer to resources that are undeniably and inherently public such as recreational parks, watersheds, the sky, ecosystem services like climate stability and waste absorption capacity (Barnes 2001; Daly & Farley 2004; Friends of the Commons, 2003). Unlike market goods, there are no boundaries (property rights) that claim individual ownership over these resources – everyone on the planet is entitled to clean water to drink and clean air to breathe. What the economic model *does* tend to take into account is material cause, known as stock-flow resources. A stock can provide a flow of materials, at any rate desirable, where production is measure by the physical amount of goods and services produced from a stock (Daly & Farley 2004). A forest, for example, is a valuable stock of trees where their trunks provide a flow of timber goods that have a market price. Timber is characteristic of stock-flow resources in that it may be stock-piled for future use, but the supply is not infinite. The "market is like a runaway steam engine," (Friends of the Commons,

pg 8) due to the lack of governance over the depletion of natural resources. Without the association of the surrounding environment or regard of degrading market activities, individual, profit-seeking tendencies persist and cumulate to a tragic overuse and potential destruction of public goods (Ostrom et al. 1999; Barnes 2006; Friends of the Commons; Daly & Farley 2004; Barnes 2001; Goodland 1992).

Of great importance to the functions of human life, and often over-looked (Barnes 2001), are services provided by another type of resource known as a fund-service. Fund-service resources, in contrast, are not used up, but worn out over time and are generally public goods or referred to as common assets. These services include natural resources that comprise our atmosphere, biosphere, hydrosphere, and sociosphere. They provide services such as waste absorption, climate stability, drinking water, and information that carry out life sustaining. Because it is very difficult to control individual use for resources inherent to such a vast community, there are no mechanisms that curb or exclude the benefits gained by them (2001).

The problem stands in the economic characteristics of these resources and the ability to provide fair distribution of benefits. For most fund-service resources, problems arise due to the absence of property rights. In a conventional market, price reflects scarcity and price determines demand and supply. In the absence of property rights, also referred to as non-excludability, when use is not prevented by others, profits are not generated and market forces are not dedicated to allocate benefits. No presence of price signal means value is not determined, thus services are exploited to increase supply and stabilize costs, leaving less for others to use, a case known as rivalness (Daly and Farley 2004).

The lack of enforced property rights occurs in the case of open access regimes, fund-services which are non-excludable but rival (one person's use of a resources leaves less available for another), and exists in the situation known as the "tragedy of the commons." Waste absorption capacity with unregulated pollutant caps is an example of an open access regime that we will delve into further later on.

The tragedy of the commons refers to the misuse of common pool resources that would not occur if the property were owned by one private owner, or in the presence of mutual coercion. Mutual coercion refers to mutual agreements by a majority of those people affected to avoid the "horror of the commons" (Hardin, 1968). Modern economists have acknowledged the trend of people to overuse common resources where if a number of people have access to a particular

resource the total number of units withdrawn from the resource will be greater than the efficient or optimal level of withdrawal. This theory has been analyzed and modeled as 'the prisoner's dilemma' (Ostrom, 1990). The "tragedy of the commons" has also been studied as the 'free access equilibrium' in which no restrictions are given in use of a common resource (Brito, 1997).

When discussing common resources, the property rights which govern them must also be addressed. The "tragedy of the commons" should perhaps refer only to those resources considered 'open-access' where no ownership rights exist as opposed to a common resource where a community can effectively exclude access to others. Only when physical or socio-economic forces undermine the property rights of common owners does the equilibrium tend to fall to an open-access regime. If the proper mechanisms are applied to strengthen the rights of the community ownership, this situation can be avoided. Sound regulations and enforcement as well as the development of community driven robust social norms will further strengthen the common access regime (Anderson 2003, Levin 2006). The important distinction between open-access and common resources is not a difference in type or enforcement of property rights, but the lack of property rights in open access regimes, which can lead to extinction of the resource through overuse (Anderson 2003). The result of overuse is the surpassing of a threshold in which the ecosystem can no longer reproduce itself, leading to a loss of function and consequently a loss of economic benefit (Farley 2009).

Goods that have enforceable property rights yet are not degraded by marginal use, such as information, are categorized as non-rival and excludable and represent another market failure. Take a patent on a renewable energy technology, for example. The information is privatized so that no one else has access to the technology unless they can afford it, however the use of that information is not made less useful to others. The excludability of information has been thought to subdue innovation because new knowledge is based on the flow of existing knowledge (Daly and Farley, 2004). However, the dilemma in this case proves to be the price incentive for market forces to provide the technology. A system dealing with intellectual property is criticized in that the innovators receive benefits far greater than the costs to conceptualize (Gallani 2001) which reflects the ability of just distribution of wealth regarding rent collection.

Public goods prove to be an obstacle due to discrepancies in value. They are non-excludable and non-rival such as climate regulation and ecosystem services provided by forests. The service itself is a public good because its ability to regulate pollutants is shared by everyone

who chooses to conserve forests, and is not excludable by any means attributable to its existence outside conventional markets. Its capacity to regulate climate depends on individual's worth of conserving the forest – climate stability may be valued more by one individual than the other. This is known as the free rider effect: one who enjoys the benefit of a public good without paying a share of its provisions and maintenance (Daly and Farley 2004). Such an affect may be considered an externality.

Externalities are generally associated with public goods and are another type of market failure. They are the unintended impacts of an activity or transaction by one party unto another party with no compensation for the change in welfare that occurs (Daly and Farley, 2004).

Successful management of resources inherently common to all can be provided by a common asset trust (CAT) designed to propose property between private property and state property (Barnes 2001). A CAT is a legal entity with explicit obligations to protect, manage, and create common assets for the common good of present and future generations (Farley 2009). Resources that would be included within a CAT would be those that *are* commonly owned that for reasons of justice, sustainability or efficiency, resources that *should* be commonly owned. The goal of common management is to preserve resources without diminishing capital (Friends of the Commons, p. 8). Putting a price on a resource that has not previously existed within the market realm through a payment scheme (PES), regulates the use of the asset. Providing incentive to preserve resources by paying dividends, allow commons members to share benefits while living off the income it provides through PES. The design of the CAT will diminish the number of externalities so to not degrade the environment for future generations.

Decentralizing government control of state assets to local decision making bodies empowers the local administration and can be a mechanism of participation (Ribot 1999). A Common Asset Trust invites the state of Vermont's citizens to consider the advantages and disadvantages in establishing caps for the use of resources that are considered common assets. Firstly, provided with research sufficient to make informed decisions, Vermont legislatures will propose resources that will be included in the Common Asset Trust. Identification of such resources will be judged on the criteria of justice, sustainability and efficiency. The identification of mechanisms to integrate those assets into the trust would also be analyzed so that it may be determined that VCAT is superior to private ownership.

The market failures discussed are largely associated with the failure to capture rent created by scarcity. Economic rent is defined as the difference in the cost of supplying a good, including fair returns to labor and capital, and the price of the good (Daly and Farley, 2004). Rent can be created by high demand for a good in low supply (Barnes, 2000). Rent capture is a major factor contributing to income inequality due to the ability to afford the user cost (the opportunity cost of using it today) or the discount rate (opportunity cost of waiting to use it in the future), activities which ultimately determine productivity and externalities (Daly and Farley, 2004).

Certain ecosystem services also have characteristics leading to a high scarcity rent. For example, because of the finite ability of the atmosphere to absorb various pollutants, waste absorption capacity in the atmosphere becomes scarcer the more we pollute. Scarcity rent is thus created, but currently not captured (Barnes, 2000). In the market system the owner of the good charges the non-owner, but in this case no one owns the sky. Creating an 'ownership' of the sky would allow the capture of rent. The question then becomes who should own the sky (or other resource of this nature)?

A few options arise when looking for the appropriate owners for common goods. In the past the government has managed common assets (or failed to manage them) but for a number of reasons this does not present an ideal situation. The government, owners of the broadcasting licenses managing the finite electromagnetic waves needed for digital broadcasting, gave these licenses to private companies foregoing an estimated $70 billion in rent which could have been collected through auctioned permits (Common Cause, 2005). The government has actually been known for this type of behavior in many other cases including land grants and "free rides" where common assets are given to private firms at a cost well below efficient market value (Barnes, 2000). The interests of the public can not necessarily be guaranteed in a government-owned common asset. If private ownership of the asset ensued, powerful corporate firms would forever collect the rent (provided by scarcity and presumably belonging to the community). The firms do nothing note-worthy to attain this value, it is provided by society (Barnes 2000).

This leads to the final option where the asset is owned and managed by the public. In this scenario a trust is established to collect revenue from a mechanism such as cap-and trade where permits are auctioned and traded in the market. This revenue captures the scarcity rent and can be used to be redistributed for the common well-being. whether it is through dividends to

individuals or investment in public goods leads to a progressive impact on income distribution (Barnes 2000). This system has been successfully and effectively implemented with the model example being the Alaska Permanent Fund.

The State of Alaska has embraced the underlying concepts behind citizen ownership of common resources by creating a permanent trust fund for oil revenues. A semi-independent corporation manages the income by investing it in various assets. The principal money is perpetually saved (or kept in investment) while the earnings from investment can be spent, however most of the money spent has been distributed in dividends to qualified Alaskan residents (Alaska Permanent Fund Corporation, 2009). Dividend distribution was not discussed until two years after the establishment of the Fund. After some debate on the design of the dividend, it was decided every Alaskan citizen regardless of age, income, or length of residence planning on staying the in state of Alaska would receive a yearly cash payment. The dividend program has two features particularly supporting wealth redistribution. The dividend is liable to a federal tax; therefore the after-tax distribution favors lower-income residents with large families. The second feature is a "hold-harmless" program the government has implemented to offset the reduction in loss of benefits through income support programs some households would suffer in the month of check distribution (Goldsmith, 2002).

Methodology

We have examined the externalities and unjust distribution of resources and public goods which result from current market failures. This includes the methodology of markets determination of value for rival and non rival goods, and excludable and non excludable resources. In order to analyze these failures it is necessary to examine the current allocation methods of natural resources and services such as information, aquifers, and forests. In building off the previous VCAT (see Farley VCAT 2009) work done we will examine past and current programs which are being utilized to manage resources such as air, fish stocks, and information, which conventional markets can degrade and fail to properly allocate.

The mechanisms for inclusion in the previous work discussed the ideas of rent capture and redistribution and property rights. These mechanisms will still stand as the prominent tools in acquiring material assets. Analyzing past and current programs will help to build off these

ideas. To further this we will expand on how to incorporate non material resources such as information; which deals heavily with legal patents.

In order to create a criteria for inclusion, it is necessary to determine how resources would be better managed by the VCAT for sustainable scale, just distribution, and efficient allocation. The VCAT may be useful for managing certain resources while it may prove difficult regulating certain aspects of others. The methodology used in the previous work was not clear in all aspects, quite general, and can be improved upon greatly. The first step in this process will be to define what can be considered a common asset. If determined to be a common asset, it must then be determined if the scale of use would be better regulated under VCAT. The asset must also meet the criteria for just distribution and efficient allocation demonstrating a potential benefit for inclusion in the VCAT.

Taking the criteria for inclusion to the next level we will analyze the four common assets in Vermont of information, forests, and aquifers. The first steps in this process will be taking each resource through the criteria outlining how each resource meets the qualifications to be eligible for inclusion in the VCAT.. Information regulation will look at how information is managed with a large focus on patents. Vermont's forests as assets lean towards ecosystem goods and services provided by them including carbon sequestration and storm water retention. The focus within analyzing aquifers as a potential resource in the VCAT will examine ecosystem, public, and commercial services that they provide. Each group member will investigate one of these resources. It is important when looking at each resource that not all aspects could be best managed using a CAT. Achieving sustainability can be difficult in that society relies on many resources to function, some of which are nonrenewable. Ecosystem services are extremely complex, hard to quantify, are highly debated, and can be even harder to assign a relevant market value.

A) Sustainable Scale

In our current economic system the 'desirable' ends of the market are measured as the perpetual growth of Gross domestic Product. A decrease or stagnation of this number causes distress to economists worldwide. An ever-increasing GDP, however by the laws of thermodynamics yield ever-increasing throughputs, pressing towards ecological thresholds of critical depensation points and waste absorption capacity.

Historic examples of civilizations overwhelming their carrying capacities include the Mayan empire and Easter Island. These civilizations were isolated incidents overwhelming only local carrying capacities. Today, however with a world population of over 6 billion and the advancement of international markets local carrying capacities become less relevant (Daly and Farley, 2004). Now, as we deal in a global system we have only one chance to see if our system works; scale then becomes an extremely influential factor in deciding the extent of economic growth desired.

Developed and perhaps overdeveloped countries such as the United States tend to send the environmental costs of their consumption elsewhere, particularly places with less stringent environmental laws (Daly and Farley, 2004).It may seem as though economic growth improves environmental quality; on a global scale, however, the net impact may be highly negative. As developed countries export waste products and import goods or resources harvested or manufactured with unsustainable practices local environments may become cleaner, but the impacts increase dramatically on a global scale. Although the effects may not be seen in the developed countries, the consumption there results in a net loss of ecosystem services worldwide.

It is clear markets do not account for many environmental costs, with international markets being especially blind to these negative externalities. A sustainable scale must be achieved on a local and global level, which will not overwhelm ecological barriers in any region. Developed countries must begin to standardize political institutions to address environmental externalities globally by internalizing costs at least to the country governing a firm if not the firm itself generating the externalities (Daly and Farley, 2004).

B) Just Distribution:

Who is to say that an individual has the right to use a common resource to an extent that it degrades the quality for the rest of its owners? The conventional sense is that whoever can afford it, can use it at any rate they please. Take a resource such as climate stability, a service provided by standing forests, for instance. Such a service has no market value and is not owned by anyone or institution. An individual can purchase forestland so that they may cut the trees down and turn it into pasture for cattle, a make a profit from it. The individual may continue to do so at a rate that their wealth can afford, while degrading the efficiency of climate stability with every tree that is hacked down. The community members in proximity to the forests have

no say in how it should be used because they simply cannot afford to put the forest under conservation.

If a CAT were to exist in this scenario, the community members would have a say in whether the forest should provide pasture to cattle or climate stability to humans. Giving the local population ownership gives them the ability to manage resources in ways they see fit and allows them to internalize the negative externalities and limit transaction costs.

Resources that support human welfare should not be distributed to those than can capture the returns of the resource without any compensation to the negative externalities they incur. An appropriate method to attain just distribution may be through subsidies. When owned, publicly or by the state, the resource in question may have a price of extraction, or a royality in which one is willing to pay to use it. The royalties gained can be used as new revenue for state programs or use them to cut taxes (Roodman, 1998). By spending the royalty on public goods or using it to reduce taxes, the state can use rents to improve distribution.

C) Efficient Allocation

Within economics and ecological thinking, efficient allocation seeks two different ends. Due to the fact that our economic system primarily dictates how we manage our resources, its valuation methods are used for both cases. Markets seek to achieve maximum efficiency by allocating goods to the source which will generate the most gains as a product of supply and demand. This system does a poor job at valuing non market goods such as ecosystem services, it also does not take into account positive or negative externalities associated with resource use. Inherent in this problem is the complexity associated with ecosystem goods and services as well as the difficulty in assigning values to non market goods. It is important in achieving efficient allocation that information is freely shared with all involved parties. In our economic systems goal of achieving pareto efficiency price is used as the major feedback mechanism.

When determining the value of an ecosystem it is clear that our natural resources do not functionally change on the same scale of our created prices based off supply and demand. This scale places our natural resources at the mercy of demand which directly impacts the supply available to current and future generations. This unveils another issue concerning the current market valuation technique of discounting rates for the future. This compares the present value of a good to the future value of a good, in which discounted rates predict low values to natural resources encouraging current consumption. When concerning time, it is also necessary to

consider the rights of future generations to current resources. This is largely an ethical debate and one poorly analyzed by neoclassical economics. Resource allocation using pareto optimality can lead to immediate privatized benefits followed by decreased ecosystem services with externalized and socialized losses.

Criteria for inclusion of Resources into VCAT

I. The Asset must be determined a common asset to all Vermonters. The inherent characteristics of eligible common assets include (but are not limited to) one or more of the following:

- Any asset "inherited or created together" should be included in the trust (Farley, 2008)
- The Asset can be improved through use by Vermonters but will be hindered by restriction from use through the market system.
- The effects of use and/or overuse of a resource will affect Vermonters not involved in the unsustainable extraction of the resource.
    - (i.e. Unsustainable use of my farm pond will not affect other farms who created their own ponds, however overuse of an aquifer by a corporation will affect everyone in the surrounding area)
- Negative externalities, (particularly environmental) associated with using or extracting the resource, are socialized while profits are privatized (Daly and Farley 2004).

II. By implementing the resource to VCAT one or more of the following desirable ends will be met. If the resource meets any of these criteria inclusion to the VCAT would be recommended, however the more criterion that are met, the more appropriate and urgent its inclusion. If at least one criterion from each category is met, inclusion to VCAT is recommended strongly.

Sustainable scale:

- The sustainable extraction/use of the resource is determined, or can be predicted using the precautionary principle and current extraction/management/use of the resource does not meet its sustainable scale.

--a renewable resource being extracted faster than it can generate itself is by definition unsustainable and is subject to inclusion. (Daly and Cobb, 1989)

-- Non-renewable resources cannot be extracted faster than they are replaced by renewable resources. Therefore non-renewable resources must be managed in complement with renewable resources to ensure sustainability. (Daly and Cobb, 1989)

- If no local, state or federal management programs exist, or if these programs can be deemed ineffective according to the previous criterion, the asset is eligible for inclusion.
    - If the programs currently in place are effective, the resource may still be acceptable for inclusion, however it must be considered first if inclusion in the VCAT will be more effective than current management. If management programs do not have long term commitments, inclusion in VCAT may be necessary to ensure the sustainable use of the resource in the long term. This is addressed under just distribution.
    - If the resource meets various other criteria and has been determined appropriate for inclusion the existing programs may be able to merge with VCAT to address all the goals towards its sustainable management

Just Distribution:

- When an asset generates economic rent, the rent should be captured by the trust. (Farley 2008)

- If the (proposed) common owners (Vermonters) do not receive benefits, either from ecosystem services or through monetary or social compensation, from the extraction/use of a resource it is eligible to be included into VCAT to ensure equal sharing of benefits.

- Non-renewable resources must consider future generations.
    - If the resource is currently being used or extracted in a way disregarding the share of future generations it is eligible for inclusion.
    - If *all* Vermonters are not receiving benefits from the extraction/use of the resource (specifically for non-renewable resources) it is eligible for inclusion.

- The costs of resource extraction must be considered. The resource should be included to VCAT if extraction/use costs are placed on Vermonters not directly benefiting from the extraction/use of the resource. i.e. The loss of ecosystem services from developing a wetland are a burden placed on any Vermonters in the vicinity of the wetland, not the developers building on the wetland.

Efficient Allocation:

- If the marginal costs to the common owners are greater than the marginal benefits to the common owners, the resource is not being allocated efficiently. (Daly and Farley 2004)
    - The marginal costs to the owners will always be greater than the benefits if the profits of production/extraction/use involving the resource are privatized by a corporation or private owner.
- If those negatively affected by the extraction/use of a resource are not being adequately compensated the resource is not being allocated efficiently (Daly and Farley, 2004)
    - Inclusion to VCAT should facilitate compensation to those negatively affected by extraction/use of a resource. Alternately the VCAT may compensate those providing positive externalities to the community.
    - The asset is subject to inclusion if more monetary value can be generated through the trust (Farley, 2008)

III. The Asset can be effectively and economically measured and managed by a specific mechanism within the abilities of a Common Assets Trust.

- Enough research and evidence exists currently to monitor the quality, use and extraction of the resource.

  NOTE: if the asset does NOT meet this criterion we do not intend to ignore the importance of the asset; the ecosystems we understand the least may well be the most important. However, we do not think inclusion to VCAT will effectively lead the resource towards our desirable ends. In many cases different conservation efforts without influences from the market system may be more appropriate.

- The field work and research required can be done in a cost-effective manner on a regular basis. Resources that can be adequately monitored by volunteers or civilians are especially favorable.

Analysis of three Resources as Case Studies for eligibility and mechanisms for Inclusion into VCAT

The resources to use as case studies were chosen to represent the different characteristics of market goods according to the matrix of Rival and Excludable goods.

	Excludable	Non-excludable
Rival	Forest Eco-system services	Information
Non rival (but congestible)	Aquifers	Forest Eco-system services

This classification system is vague and the specifics of these resources vary. The rival and excludable category represents a market good. The other categories represent market failures

when they are implemented into a market system. Further research would delve into more resources in each category to develop mechanisms appropriate for a resource dependent on its inherent characteristics. This section of the paper analyses the three 'non-market good' categories to find whether or not the VCAT would appropriately allocate them towards our previously mentioned desirable ends and develop realistic mechanisms for inclusion and management of the resources through a Vermont Common Assets Trust.

A) Forest Ecosystem Goods and Services

Mechanisms for inclusion:

To implement the effectiveness of the VCAT to protect Vermont's forests resources requires methods for obtaining ownership or capturing revenue from their associated use. There are multiple options for inclusion of these resources including buying land outright. In order to best economically deal with this the VCAT can seek to use property easements, local land trusts, and restrictions on property rights through local, state, or federal courts. Methods to obtain and distribute compensation for decreased forest ecosystem services include command and control regulations, a Pigouvian tax or subsidy, subsidies to forest land owners, basing resource use on the precautionary principle, direct payment for ecosystem services, tradable carbon credits, and management incentives such as payments or penalties. Taxes can be used within each of these methods. Subsidies from the government could be used to encourage and partially cover current management techniques which have positive externalities. This could make these practices more economically feasible or provide compensation to the public for the use of a resource. Pigouvian taxes result in a tax in which the economic agent is forced to internalize the economic costs which are currently externalized. In contrast a Pigouvian subsidy pays for a reduction in associated environmental costs. This would require a standardized method for valuing ecosystem goods and services and their losses outside of neoclassical economics. A system to achieve similar ends which acts as a positive feedback loop is a cap and trade system. Systems such as this are commonly used to regulate pollution and resource stocks such as fisheries. First a quota is issued which sets an upper limit, then permits are issued to the involved parties. These permits can then be traded, sold, or bought. The goal is to then gradually reduce to quota and reduce resource depletion or pollution. This creates incentives to permit holders to reduce their resource use or emissions, which will then allow them to sell their permits and maximize profits. Forests can play a direct role because of their ability to sequester carbon; this allows

them to become a market good as carbon credits. Depending on the system an alternative to a firm reducing pollution would be to purchase these carbon credits. Using the precautionary principle the resource harvester must create a fund outright to compensate for any potential associated negative externalities. If harvesting one of these resources has negative externalities a portion of this fund will go to the VCAT for distribution. The portion taken will vary directly with the severity of the externalities. Penalties such as revenue taxes can serve to capture compensation for resource use while providing an incentive for more sustainable practices.(Daly 2004)

The ownership of property is really the acquisition of what is called the bundle of rights to the land. These rights are numerous and include the right to sell or assign interests (such as resources), cultivation, and the rights to minerals on the land. The majority of the land is owned in a free hold estate and an estate in fee simple in which the most extensive bundle of rights is associated with no associated fixed limits on the rights or time limits on which the rights can be passed. Certain rights can be sold or exempted from the ownership which presents the VCAT with possibilities for obtaining rights to the land without outright ownership. An easement grants certain rights to the land with dictated covenants or conditions. Conservation easements are one of the most common forms of property rights used to protect land. Seeking Joint tenants or partnerships for land ownership can be used for owning land and equally distributing the rights between all tenants, can be used for group ownership such as community forests. A trust separates the legal and beneficial interest in property. Creating a trust involves a trustor who creates the trust, a fiduciary or trustee who is responsible for acting in the interests of the beneficiary. Within the VCAT the owner of the land is the trustor, the VCAT acts as the trustee, and the public is the beneficiary. The VCAT is responsible for acting according for the interest of the public which will be accomplished by appointing the benefits of resource protection or use to the public which it affects. These property right mechanisms uproot the question of scale at which they should be applied. It may be more appropriate in certain circumstances that smaller local CAT's will be more appropriate for better management. A benefit of this would be that the local public or community would be responsible for management that directly affects them. Local goals, interests, and knowledge such as historical land use or desirable conditions would be best known and accomplished by the immediate community. If the infrastructure is not in place for this, a larger ownership such as the VCAT

could provide more centralized and appropriate management. Court's of varying levels have the ability to impose regulations on or remove land owners rights. One example of this is the federal Endangered Species Act, which forbids any action that is considered to be a take to an endangered species, regulations could potentially encourage lands inclusion into the VCAT. {McEvoy, 2005}

Sustainable Scale:

Market forces drive price directly from demand, this commonly values resources for consumption higher than the resulting loss in services which they provided. In addition land taxes are based off the highest potential value of the land. In most cases the highest associated value for land use is development. This taxes land including forests as if it were to be subdivided or developed; for the common land owner they cannot pay the high price associated with owning an intact healthy forest despite the goods and services it provides to the land owner and the public. A few programs are available which circumvent this and reduce property taxes however these programs only result in a reduced taxation and cost sharing but do not provide any other benefit to the owner despite the fact that they must bear the costs of ownership. These programs include Vermont's Agricultural and Managed Forest Land Use Value Program better known as the Current Use Program, and the Wildlife Habitat Incentives Program (WHIP). The WHIP, created by the Natural Resources Conservation Service (NRCS) under the US dept of Agriculture, is a voluntary program seeking to improve wildlife habitat, in this the federal government covers only 75% of the costs associated with the management. This leaves the landowner to bear the remaining 25% of the costs. {Agriculture, 2009} The Current Use Program allows landowners to be taxed based on the current production value of their land instead of the fair market value. In 2001 the production value of the land was found to average 20% of the fair market value. This demonstrates the failure of current markets in valuation of forested ecosystems. {Daniels, 2002} Decreasing the costs to land owners keeping their land undeveloped will help protect Vermont's stock of natural resources. Indices which can be used within the VCAT to ensure sustainable use of forest resources include the Sustainable Forestry Initiative (SFI), which offers certification to forests practicing sustainable management techniques. SFI certification then provides a premium to its products within the market place. {Inc, 2009} Premiums such as this could be captured by the VCAT and then distributed as seen fit. In an effort to reduce consumption of foreign timber, the state could mandate that a given

percent of the timber products used in state is SFI certified. Subsidies or reduced revenue taxes to decrease the cost of certified wood could also be used to decrease the cost to the consumer, allow more to be captured in a premium, and help drive more forests to be managed under the VCAT.

Just Distribution

Ecosystem services and compensation for a decreased potential of these services caused by resource extraction or use would be properly allocated within the VCAT. Forests ecosystem services are not properly valued through current market valuation methods. The largest direct market values associated with forest land are with development and timber harvesting. Harvesting timber can have varying degrees of impact ranging from improving forest health through sustainable harvesting silvicultural techniques, to clear cutting the entire forest; under full property rights either extreme is perfectly legal. Development can include building houses constructing roads, converting to agriculture and any change to the landscape. Development and harvesting timber can provide direct benefits to the property owner, developer, or logger however no compensation is given to the public due to the loss in ecosystem services. This functions to privatize the benefits and to socialize the losses. Ecosystem services which may be lost to development or extraction can include soil fertility, aesthetics, timber, biodiversity, flood water storage, clean water, clean air, carbon storage in soils and trees, and wildlife habitat among many others. Inclusion within the VCAT would ensure that any loss created would be compensated to the VCAT, from which it can be distributed to the common owners and used for furthering the potential of the VCAT itself.(Farley 2008)

Efficient Allocation

Allocation of resources refers more to what comes from the forest and where these resources are transported. Within the timber market the timber resource travels from the land through various mediums to consumption using current market valuation techniques. This places resource use directly in the hands of the entity which is willing to pay the most. (Daly 2004) This flow represents a closed circuit with the resulting profits going to the privatized entity of the land owner(s). Carbon markets or offsets allow industries to purchase the value in carbon sequestration to the forests. In reality this is a non excludable resource, however if the legal title dictates that the ability of the forest to sequester carbon can be owned, it can legally be made rival. In the current market if there is a sudden increase in demand for wood products, such as

during a housing boom; the best allocation of timber would be cut and placed into the timber market. This leaves land owners little incentive to leave timber for other lower market value sources such as carbon sequestration or wildlife habitat. This case which strives towards pareto efficiency demonstrates how using simple price mechanisms based off supply and demand fail to achieve efficient allocation. In addition a land owner seeking to maximize profits would completely clear all of the forest leaving little regeneration and decreasing the ability of the stock flow resource to restore itself.(Daly 2004) Efficient allocation seeks to maximize the benefits to all Vermonter's who are affected by the resources use without relying on the feedback mechanisms created by our economic systems. One mechanism for allocating funding to the non market services provided by forest ecosystems is through government subsidies. Associated privatized activities such as sustainable harvesting can create positive externalities such as increased carbon uptake or decreased erosion potential. Government subsidies could aid in activities associated with creating these positive externalities such as the regulated Acceptable Management Practices (AMP's) and make the activities more feasible to the private sector. Within the VCAT the use of a common resource will result directly to a distributed benefit to Vermont's public. Eliminating the direct market values associated with forests will create a better allocation of the intangible or negligibly valued ecosystem services which they provide.

B) Groundwater Aquifers

Aquifers are generally a rival, non excludable resource. When generalizing all aquifers, however, this may not hold true where some people have easier access to pumping groundwater than others. An aquifer is a resource subject to regeneration as well as risks depletion and one persons' use of the water leaves less for others (Ostrom, 2002). The aquifer may therefore be considered congestible as there is really only less groundwater left after my use if the aquifer is being pumped by too many firms faster than in can regenerate itself. An aquifer in a steady state condition of only being pumped at a rate which it can generate itself can be considered a fund-service resource.

Using the Criteria listed above, aquifers have the inherent characteristics of a common resource that should be included into a Vermont Common Assets Trust. Aquifers pass in Section I of the criteria for a number of reasons. Groundwater is an asset inherited together. In the

absence of institutional constraints, groundwater is a common property resource where a finite number of firms can exploit the resource while no particular firm can hold exclusive rights to it (Provencher and Burt, 1994). As mentioned before, the overuse of one firm will lead to consequences for all other Vermonters the aquifer for drinking and other water uses. Pumping water is relatively cheap; therefore a firm may over-pump an aquifer at a very low marginal cost. The firm is then benefiting privately while the cost of depleting the aquifer is a burden placed on all other Vermonters.

Our knowledge of groundwater aquifers is in the risk category, where we know the possible outcomes and probabilities of overusing an aquifer. The sustainable scale criteria are then fulfilled for aquifers because there is a known scale at which an aquifer can be pumped within its ability to regenerate itself. While groundwater is a renewable resource, reserves tend to replenish themselves slowly, and therefore must be used at a sustainable rate. The Ogallala aquifer is a well-known example of an aquifer used beyond its sustainable scale and whether or not to conserve the groundwater in this large aquifer has become a topic of much debate (Peterson et al. 2003). It must be considered within this section that aquifers also provide a buffer against droughts. If an aquifer has been used beyond its sustainable scale and is depleted, this natural safety net will no longer provide relief in times of need. This should also be considered under the Just distribution criteria.

The depletion of an aquifer has impacts on the just distribution of water among Vermonters as well as future generations. If an aquifer is depleted and can no longer provide a guaranteed supply of water during times of need, those than do not have direct access to the water or cannot afford to buy water from those that do will not be able to meet their basic needs. This loss of ecosystem services places a burden on all Vermonters. Including groundwater aquifers into a VCAT system would allow the trust to capture rent created by limiting permit allotments to an amount deemed by the sustainable scale.

The market failure of aquifers can be easily demonstrated. When a groundwater source is common property without restriction to pumping, stock externalities produce an inefficient rate of pumping (Provencher, 1993). People hold property rights to pump water that do not reflect the actual value of the water being pumped. Therefore as an aquifer begins to fall below a steady-state level, the water does not become more expensive. The marginal cost of using the water does not reflect the price of pumping it. The private costs of pumping are much less than

the social costs producing excessive pumping beyond an economically efficient level (Peterson et al, 2003). Especially in times when groundwater stock is low, a firm considers only the private benefit of pumping and does not then pump at the socially optimal rate (Provencher and Burt, 1994). These characteristics meet the criteria for inclusion dependent on efficient allocation perfectly; strongly suggesting including Vermont's groundwater aquifers into the VCAT would increase the efficiency of pumping them.

Provencher and Burt (1994), suggest privatizing groundwater supplies by creating tradable permits to the 'in situ' groundwater stock. These permits would be distributed and managed by the VCAT and controlled over time. In times of low-regeneration of the aquifer, the amount of groundwater allowed by each permit is reduced. Firms can either trade the permits or pump groundwater. A firms' consumption is constrained by its allotted permits, which can be amended by buying or selling permits. The VCAT's role would be as the regulator. The VCAT would be responsible then for deciding on the initial number of permits allowed, and regulating how much stock each permit accounts for. Another mechanism tactic suggested by Peterson et al. (2003) was do deny any new permits where another pumping well would reduce the ability of others in the local area to pump from currently existing wells. This has been done in Kansas, New Mexico and Colorado.

A mechanism to address just distribution and efficient allocation would include limiting groundwater use by economic incentive. This would allow a certain amount of water use for necessary activities to all Vermonters. The price of water use would then be on an increasing scale to mimic the marginal cost of increased use. This would produce an economically efficient outcome while ensuring reasonable water availability to all Vermonters. This mechanism, however does not necessarily address sustainable scale.

A mechanism combining the two may address all the desirable ends most effectively. This mechanism would allow a permit system that caps the groundwater use at a precautionary level that will not allow the depletion of the aquifer. All Vermonters would then be allotted a certain number of permits for free, while extra permits would be sold within the market. Firms willing to pay for use of extra water will then have to purchase permits for this extra use.

C) Information

The term "extraction" in relation to information, should be considered in two lights: acquiring knowledge from a source; and withholding knowledge by means of a patent. Depending on the extraction method, information takes on differing qualities of a good and have varying consequences that ultimately determine their legitimacy in inclusion. A separate analysis will be demonstrated based on the criteria.

When it comes to information, there are no actual biophysical limits to its growth, instead, there appears to be a sociopolitical one. The creation of information arises from "standing on the shoulders of giants," whereby one innovator's discovery is based off of previous information. The knowledge gained in past generations greatly determines those values of information in the present and in the future. Therefore, previous knowledge is needed in creating new information.

Patents law defines the conditions that affect the incentives for, and constraints on, innovation. In other words, a patent is intellectual property protection that its applicants use against competition by claiming broad protection over an idea in the market. Exclusion is not an inherent property of goods but a legal regime based on social choice can make it so (Gallini and Scotchmer 2001). Therefore, the use of a patent temporarily extracts information from public use, constituting its excludability. What is said to encourage intellectual property are the rewards involved. The rewards have said to be much loftier than what it actually costs to spur innovation. For these causes, patents could potentially degrade adequate information for future generations.

At practicially unreachable prices, the availability of information could have serious effects on human health and well-being. Let's consider AIDS medicine. If it were known that a new recipe of medication has been discovered to curtail the risk of HIV transmission, then no one is excluded from this health benefit. If a patent protected the medication's prescription, it would make the health benefits incredibly expensive. Pharmaceutical companies who profit from patents on medications that significantly increase health, argue that without patents, there would be no profit, and without profit, there would be less incentive to invent new drugs. Since patents create a type of monopoly, then they should not exist in a free market system by those who are more able to obtain them.

Information typically has a high fixed cost of production yet a low marginal cost of reproduction (Varian 1998). Under a patent, when information of an invention is made excludable for a fixed period, the ability to obtain that information, however vital, is restricted. This may cause the rate of innovation thus the rate at which new information is generated and used. Since patents are so expensive to attain, their prices tend to deter researchers from innovation, slighting the desire to research and the expected output of new information.

The risk of creating a monopoly is high if this is this case. If a firm were to set its royalty freely, known as *first-degree price discrimination*, the total royalty to be paid by a patentee will be so high that it may cause massive underutilization of technology and deter the progress of science (Aoki and Nagaoki 2005; Varian 2003).

This may be avoided by voluntary cooperation among firms. To avoid this, a collective licensing body through a patent pool could offset royalty accumulation and determine a reasonable and non-discriminatory royalty level. Collaborative efforts among patent-holding firms in a patent pool could generate a coordinated reduction in individual royalties while increasing total revenue royalty for the group. A coalition could generate positive externality to consumers. A patent pool lowers the number of firms collecting individual royalties that allows the technology to be offered at a more reasonable price. A strategic substitute nature will presumably arise if the coalition is large. That is, in response to a more reasonable price set by the large coalition, rival firms(substitute technology) will presumably drive down their price, ultimately benefiting the consumer. Thus, a coalition is super-additive only if its size is more than a critical level. Such coalition can only be a grand coalition when the number of firms independently collecting royalties is small. Realistically, the Vermont Common Asset Trust may not be the best vehicle for a patent pool for the reason that patents can be highly individual for reasons of intellectual competition. VCAT is not an environment that will encourage competition but should encourage cooperation.

The extraction of information from a public domain (e.g a library or Internet) is a common good. It is non-rival and non-excludable. Taking information in does not congest an individual's stock of knowledge or degrade quality but likely increases the outflow of improved information. The knowledge one has may be passed on to another via various forms of interaction and may enhance the flows into the information society.

The costs of extraction in a public domain are zero. If information is free, it will presumably be used until the marginal benefits of use of just equal to the marginal cost of additional use (Daly and Farley 2004). Volunteers (actors) in an information society is somewhat analogous to Linux is an open-source operating system that is continually evolving and improving through inputs by software specialists. It proves that neither profits nor patents are necessary incentives for innovation.

VCAT may want to consider another form of making information available to Vermonters. The Isle of Mann recently proposed an internet service that would allow unlimited music downloads to subscribers who would pay a nominal fee of $1.38 a month to service providers. The collected money from the state-imposed tax would be distributed to the copyright owners such as the record labels and music publishers based, on how many times their music was downloaded or streamed over the Internet (Pfanner 2009).

VCAT my also act as a *knowledge commons* that fosters sharing in an open environment. Information Commons activity includes emphasis on higher technologies and a focus on information access for various groups (students and citizens). Information commons refers to the world of information via the Web; computer technologies of institutions; and integrated centers for research. In order for the commons to properly provide information, they must supply research guidance and technical support for patrons; access to appropriate hardware and software; appropriate physical spaces to enhance patron's production; clear intent to involve staff to create, support and maintain services; and an environment that encourages and nurtures evolutionary change (Bailey and Tierney 2002). VCAT would be an acceptable engine of knowledge where innovators could openly share and collaborate to stimulate useful information for their family and friends today and for the generations to come.

Conclusion

A Vermont Common Assets trust will be an extremely effective mechanism to move Vermont towards a sustainable future in managing our natural resources and promoting the improvement of access to and benefits from our common goods. Although the management of many goods may be improved by inclusion into VCAT, it is important to develop criteria and

continue to evaluate a resource to ensure VCAT is the appropriate way to approach our desirable ends. Once a resource can be determined appropriate for inclusion to a common assets trust, developing an appropriate mechanism is just as important. Further research is necessary to evaluate all of Vermont's common resources, to determine how the VCAT can be effective in managing and promoting efficient, just and sustainable use for the benefit of all Vermonters now and in the future.

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