



Environmental Sustainability and the Nexus of Economic Principles and Jewish Thought

BY/PAR REBECCA LEE HARRIS (1) & RABBI ED ROSENTHAL (2)

- (1) Kate Tiedemann College of Business, University of South Florida St. Petersburg
(2) Executive Director and Campus Rabbi, Hillels of the Florida Suncoast

ABSTRACT

The purpose of this paper is to show that the economic ideas related to environmental sustainability are consistent with centuries of Jewish thought on the matter, as seen through Torah, Rabbinic commentaries, Kabbalah, and other teachings. In particular, we examine 5 economic principles for moving society toward a more sustainable path: the full cost principle; the cost-effectiveness principle; the property rights principle; the sustainability principle; and the information principle. After explaining each economic principle, we relate it to Jewish texts and teachings. Even though the Jewish thinkers of old did not face the same environmental challenges present in modern times, their writings are consistent with the economic proscriptions that can help achieve environmental sustainability today.

Keywords: environmental sustainability; economics; Jewish ethics; Torah; Talmud

RESUME

Le but de cet article est de montrer que les idées économiques liées à la durabilité de l'environnement sont en accord avec les siècles de pensée juive à ce sujet, tels que la Torah, les commentaires rabbiniques, la Kabbale et d'autres enseignements. En particulier, nous examinons 5 principes économiques pour faire évoluer la société vers une voie plus durable: le principe du coût intégral; le principe du rapport coût-efficacité; le principe des droits de propriété; le principe de durabilité; et le principe d'information. Après avoir expliqué chaque principe économique, nous le relierons aux textes et aux enseignements juifs. Même si les penseurs juifs d'autrefois n'ont pas fait face aux mêmes défis environnementaux que ceux des temps modernes présents, leurs écrits sont compatibles avec les proscriptions économiques qui peuvent aider à atteindre la durabilité environnementale aujourd'hui.

Mots-clés : durabilité environnementale; économie; Éthique juive; Torah; Talmud

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1. INTRODUCTION

In one sense, the concept of "sustainability" is relatively new, only showing up in academic and policy circles following conventions and reports by the United Nations in the 1980s. A survey by Caradonna (2017) shows over 5,000 books with the word "sustainable" or "sustainability" in their title published since 2000, compared to none before 1976. Indeed, the term sustainability has now become so ubiquitous as to worry some of its overuse or misuse. (Caradonna, 2017) Literature aside, since the start of the Industrial Revolution in the mid 1700s, human activity has put the world on an unsustainable path.

That path is most dramatically exemplified by climate change. A review of the assessment reports by the Intergovernmental Panel on Climate Change, starting in 1990, shows increasing strength in the belief that climate change is not only occurring but it is also largely due to anthropogenic sources (IPCC, 2014). The latest assessment report, in 2014, gives a 95-100% probability that "unequivocal" climate change is caused by human activity. Those activities include burning of fossil fuels, deforestation, pressures from over-population, and land-use change, factors which are largely interrelated and at the root of other environmental problems, like air, land, and ocean pollution. Yet, humans are not wired to naturally make the behavioral changes needed to stem the rate of climate change, let alone reverse it. (Pezzy, 1992; Marshall, 2015) Economists note that humans tend to be "selfish" or self-interested, so that most decisions are made based on very personal costs and benefits. In addition, humans tend to value those benefits that occur in the here and now over those that occur in the future; thus, any sacrifices that have to be made now, whose benefits will not occur until the future, are less likely to take place.

While environmental economists have made suggestions to policymakers on how to harness these human tendencies, the suggestions often fall on deaf political ears. The purpose of this paper is to show that the economic principles of environmental sustainability are consistent with centuries of Jewish thought on the matter, as seen through Torah, Rabbinic commentaries, Kabbalah, and other teachings. Reinhardt (2014) notes that while the Jewish population constitutes just 0.2% of the world's people, Jewish law and tradition have strongly influenced Western ethics. Due to its long and mostly nation-less history, Jewish law has developed removed from any institutional authority but with a strong tradition of debate, respect for past thinkers, and interpretation based on the place and time. This has made the body of Jewish law flexible and at times abstract. According to Reinhardt (2014), "...even secularists or atheists can take the results of this revelation which is mostly free from mere religious rituals, and use it in their reflection on topics like climate change, sustainability and an ethics of an open future." (p. 20).

In particular, Jewish environmental thought recognizes the human propensity toward infinite wants; the Torah and its commentaries show humans how to curb those instincts (Levi, 2005). Thus it is not surprising that economic proscriptions which provide a practical way to overcome the market failures in the environmental sphere also make sense in terms of the ethics and morals that are the foundation of our society.

2. WHAT IS SUSTAINABILITY?

The commonly accepted definition of sustainability comes from the Brundtland commission report from the United Nations World Commission on Environment and Development (Brundtland, 1987): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (p. 37) Environmental sustainability, then, is generally the idea that future generations should be left off no worse than current generations.

From an economics standpoint, consider the broad definition of economics as the study of how humans make decisions. More formally, as any introductory economics student can recite, economics is the study of how to allocate scarce resources across unlimited wants and needs. The economic problem is brought about by the fact that we live in a resource-constrained world. We have "unlimited wants," but limited resources with which to satisfy those wants.¹ If we didn't have resource constraints, we would have no reason to study economics; there would be no reason to try to allocate our "scarce" resources across our unlimited wants and needs. More broadly, we wouldn't have to make decisions if we had all of the time (which we must remember is a resource), money, and natural and manmade resources in the world.

If we take the commonly accepted definition from the Brundtland commission and combine it with the standard definition of economics, we might come up with a very succinct definition of sustainability, namely: making choices currently that do not negatively impact future generations' ability to make choices.

The "weak" form of this concept of sustainability is that the current generation can deplete natural capital as long as it is able to replace it with physical or man-made capital. For example, if humans depleted the earth's source of rubber but were able to replace it with a synthetic substitute, that would be a sustainable use. On the other hand, the "strong" version of sustainability, which may be harder to abide by, suggests that sustainable use of a resource is at a rate that does not diminish the resource's ability to regenerate itself for future generations. Using the rubber tree example, users would have to calculate the optimal harvesting of rubber so that the trees would have time to regenerate for the next users.

A question for economists and policymakers is whether or not the weak form of sustainability is acceptable, for it assumes that man-made capital and natural capital are perfect substitutes for each other. However, it may be easily argued (Daly, 1990) that often this is not the case. For example, across the US, there are regulations that state that a developer can destroy one wetland if he or she replaces it with a man-made wetland. Studies show, however, that the newly created wetland can be a poor substitute for the original one, in terms of soil, water hydrology, and vegetation, as well as ecosystem health generally (Hunt, n.d.).

¹ This concept of unlimited wants is also consistent with the Kabbalistic notion of the "Ain Sof" - defining God as an infinite source of energy that created a vessel with an infinite desire to receive ("kabbalah" means "to receive"). This vessel is then manifest in the physicality of the universe, including humans, who, in turn, have an infinite capacity for receiving.

The Torah establishes that humans may use the earth's natural resources, but restrictions, such as the Jewish dietary laws, are placed on such usage. The mitzvah (commandment) of Tzar Ba'alei Chayim is the general prohibition against causing pain (physical or emotional) to animals. However, it goes further than simply not causing pain and explains how to sustain a population to protect it from extinction. Deuteronomy 22:6 reads:

If a bird's nest is before you on your way, in any tree or on the ground, with young ones or eggs, and the mother is sitting upon the young, or upon the eggs, you shall not take the mother with the young.²

Nachmanides' (Rabbi Moshe ben Nachman 1194-1270) comments on this passage support only the strong version of sustainability, with the following interpretation:

Scripture will not permit a destructive act that will cause the extinction of a species even though it has permitted the ritual slaughtering of that species. And he who kills mother and children in one day, or takes them while they are free to fly away, is considered as if he destroys the species.

In other words, based on Nachmanides, depleting a natural resource like rubber, even if it can be replaced by a synthetic substitute, is not permitted because it would lead to the destruction of the species itself. This suggests that the weak version of sustainability would not be consistent with the Torah.

The biblical principle of *migrash*, regarding urban planning, supports the strong version of sustainability as well. The migrash principle is seen in Leviticus 25:34 and Numbers 35:1-15 and designs cities such that a "green belt" of commons is between cities and their surrounding fields and vineyards. Rabbi Samson Raphael Hirsch (1808-1888) comments that "all future times have equal claim to it, and in the same condition that it has been received from the past is it to be handed on to the future." (Reinhardt, 2014, p. 30)

Currently, the world is abiding by neither the strong nor the weak form of sustainability. Environmental economists Tietenberg and Lewis (2009) set out 5 principles which might aid the world in getting off of its unsustainable path: the full cost principle; the cost-effectiveness principle; the property rights principle; the sustainability principle; and the information principle. The remainder of this paper will consider each of these principles in turn, explain the economic motivation behind each one and then relate it to Jewish texts and teachings. We will then provide a related discussion on the controversial tendency of economists to put a value or price on nature. We will show that this practical necessity is also in line with Jewish tradition. A final section offers conclusions and further thoughts.

3. ECONOMIC PRINCIPLES OF SUSTAINABILITY

3.1 Full Cost Principle

The full cost principle states that all market participants (consumers, producers, and governments) should recognize and pay *all* costs in their transactions. By "all costs," we mean not just the market values of goods and services, but also intangible and/or non-market costs. These costs are often considered "social" costs in a broad sense, in which society

² All references to the Torah (the "Old Testament") and its commentaries come from www.sefaria.org, unless otherwise indicated.

bears the typical accounting costs of land, labor, capital, and inputs, but also the costs to environmental and natural resources. Indeed, economists distinguish between the so-called "private" costs that an individual or organization bears and the "social" costs.

The idea that decision-makers should include all costs of their actions, not just those that directly impact them, is consistent with the ideals of Torah as well. This is seen most clearly in the Torah's consistent theme of being a good "neighbor." As Rabbi Hirsch points out (in Wolff, 2012), the very word "neighbor" in Hebrew - *shachan* - also means to "dwell." In other words, one cannot live in a place without being concerned with one's neighbors. Thus a good neighbor must consider the social impacts or costs of any action he takes.

Rabbi Hirsch's interpretation of the Talmud's comments on the Biblical injunction to "Love your neighbor as yourself" (Lev 19:18) underscores the environmental perspective. Noting that Rabbi Akiva (50-130 C.E.) sums up the Torah with this verse, Rabbi Hirsch suggests it is meant to go beyond human neighbors to include every creature. Furthermore, it is noteworthy that Maimonides's rules that dealt with the environment are included in a section of the Mishneh Torah called *Hilchot Shechanim*, or laws of neighbors. The sages of old did not distinguish between protecting the neighbors and protecting the environment.

A full cost accounting of our activities to society would include: externalities, pollution control costs and user costs, as follows:

a) Externalities

Costs should account for non-marketed effects, which may be positive or negative, referred to in economics as externalities. An externality is sometimes called a "third party" or "spillover" effect, in which a transaction takes place between two participants but then a bystander (which could literally be a person, but could also be an impact on the environment, on health, on society, etc.) is impacted. There is no market for that effect, so the one who is negatively impacted cannot be compensated to tolerate the impact nor pay to stop the impact (and similarly for a positive effect, the one who is positively impacted does not need to pay to receive the benefit).

A prototypical example of a negative environmental externality is the pollution that results when a power plant burns fossil fuels. The producer faces costs that include the labor, capital, inputs, and so forth, of producing power. Electricity consumers pay for the power they receive. In a free (unregulated) market, the negative effect of emissions on the environment is not accounted for in the transaction between consumer and producer. An example of a positive environmental externality is if a neighbor plants a tree in his yard. The tree may make the neighborhood look nicer or it may provide shade to neighboring homes. However, the other neighbors are not obligated to pay for the tree or its upkeep, even though they benefit from it. In both of these examples, there is no market for the externality, whether negative or positive, and thus the prices of these activities cannot reflect the added costs or benefits.

Although environmental externalities were not defined as such in the Rabbinic period, various examples of environmental and other types of externalities are described in the section of the Talmud called "The order of damages" ("Nezikin"). Three tractates within that, *Bava Kama*, *Bava Metzia*, and *Bava Batra*, deal with damages resulting from negligence or situations which can or do cause damage to others and then try to devise

compensation for them. Maimonides (Rabbi Moshe ben Maimon 1135-1204) furthers this discussion in his interpretations of laws covering damages in Nizkei Mamon.

According to economic thought, an activity that produces a negative externality tends to be priced "too low," since the market price does not reflect all costs. Thus the use of this activity is more than what would be considered socially optimal. An activity that causes positive externalities is priced "too high" (since if we netted out the extra benefits of them, the price would be lower) and thus not enough of this activity occurs. This defines the concept of a "market failure," in which free markets, left on their own, do not achieve an optimal outcome. Instead, a common solution is to have the government intervene to correct prices through taxes or subsidies that reflect the external costs or benefits, respectively. These so-called Pigovian taxes, after economist A.C. Pigou (1940), are widely viewed as the most efficient way to correct an externality, as they bring the value of the externality into the decision-making process of the polluter.

Kleiman (2010) discusses the extent to which the Talmud attempts to insert the value of the externality into a transaction, referencing the question of needing to dump cargo that belongs to several owners if a ship is at risk of sinking. This case is seen in Bava Kama 116b:

A ship which was going by sea, and a gale stood to drown it and they lightened her load - they calculate shares in the loss according to the load, and do not calculate according to wealth.

Once the ship is saved, however, compensating the owner of the goods that were thrown overboard is shared by the other owners in proportion to the weights of their respective items. The justification for this is that the sum of the weight of everyone's cargo contributed to the danger to the ship. This compensation method effectively puts a weight tax on shipping goods, to try to pay for the externality caused by too much weight. This is similar to the Pigovian tax, since it creates a tax equal to the value of the externality. The main difference, as Kleiman (2010) points out, is that a Pigovian tax is imposed before negative damages occur, while shipping damages in the Talmudic period would only be assessed after the fact.

A second policy solution is to have the government regulate the production of a good that produces a negative externality, by either limiting the production or specifying a cleaner technology that must be used in the production process. This does not address the question of correcting prices and is generally considered a less efficient solution. However, there are times when it is still the best policy, such as when dealing with hazardous materials or other instances in which the optimal amount of a pollutant is simply zero. In the Biblical and Rabbinic periods, such "top down" policies were likely more common, largely due to the administrative ease of imposing them. A less sophisticated and less centralized market system would further make it difficult to impose incentive-based solutions (e.g., carbon tax, "green" subsidies, or tradable pollution permits) in those days.

Sefer Nezikin set out many regulations to control externalities, and the Talmud Bava Batra 2:9 even regulates where polluting activities must take place:

They must distance animal carcasses, graves and tanneries from a town by fifty cubits. And they may not make a tannery except to the east of a city. Rabbi Akiva says: One may set it up on any side except the west, and one must distance it fifty cubits [from the town].

In fact, in Bava Batra, most of the activities which cause externalities, from digging cisterns that may damage a neighbor's land or water, to operating threshing floors that might release particulates into the air, are dealt with via regulations and controls. Activities might be confined to certain places (such as the tanneries as mentioned above); potentially hazardous equipment, such as ovens, had to be built in a certain way to reduce risk; and even some agricultural practices were circumscribed (such as not planting leeks and onions near each other, lest one contaminate the other). Foreshadowing today's bee problem, the Talmud even requires that mustard plants be kept away from domesticated bees, so that the bees' honey would not be soured. (Wolff, 2012)

b) Pollution control costs

Complete costs also take into account the costs to society of controlling or curbing pollution. While we may typically think of these control costs as costs to the producer, we have to consider these societal costs for several reasons: first, it may be that the producer is able to pass on these costs to the consumer, such that the consumer ultimately bears the burden of the costs of controlling pollution. Secondly, even if the producer does not pass on those costs, the producer may have to cut back on production, which hurts would-be customers. In addition, if the producer cuts back on production, that could lead to job losses, with rippling effects through the economy. Relatedly, there are opportunity costs associated with controlling pollution in terms of money invested in cleaner technologies or inputs that could have been spent elsewhere in the production process. Thus economists weigh the (marginal) costs of polluting (in terms of the damages wrought) with the (marginal) costs to control that pollution. This rule tends to imply that the "optimal" level of pollution is rarely zero; rather, in order to continue to have economic activity, some level of pollution must be tolerated.³

This concept is reflected in the suggestion by Wolff (2012) that "The Torah negotiates the dynamic balance between providing people with the freedom they need to act in this world in order to meet their physical needs and wants, and protecting neighbors (society and the environment) from the damage these actions may cause." (p.3) The second chapter of Bava Batra supports this idea that there must be a balance between the costs of polluting with the cost of controlling pollution. In this chapter, there is an acknowledgment that we need to conduct activities for our physical well-being, while protecting our environment.

c) User costs

The user costs of an activity also need to be included in the full cost of an activity. In other words, when a person uses a non-renewable resource, he or she is preventing future users from enjoying that resource. The contrast between surface water allocation and groundwater allocation illustrates this point. Surface water (water in reservoirs, rivers, lakes, etc) is considered to be renewable, since it is replenished (we hope) by rain and snowmelt. Thus as long as a community's use of that body of water does not exceed the rate of replenishment, future users' ability to use that water is not in jeopardy (Note: we are referring to water quantity in this example, not water quality). On the other hand, groundwater (water from aquifers) allocation is typically modeled as a resource that does not replenish itself as quickly as humans deplete it. Thus, any use of water from this source is depriving a future

³ Exceptions to this would be toxins for which there is no acceptable amount of emissions or other emergency situations, such as a drought, in which the market is too slow to react.

user from accessing that water. The opportunity cost for that future user - ie., the value of the water that the future user never gets - must be accounted for.

The concept of user cost, or lost future benefits, is less explicit in Jewish thought, but we can glean some ideas from the Talmud. Though distasteful in our times, there are lengthy discussions of how to compensate a Hebrew slave and his owner, in the event that someone injures the slave. In Bava Kama 86a:9, if the injury is a permanent one (such as the loss of a hand), the guilty party has to compensate the slave for the "major loss of livelihood." Rava (280-352 CE) says that the slave would then take the compensation and purchase land, the profits of which will go to the master for the rest of the slave's period of slavery. In other words, the master is compensated for losing future earnings from the slave's labor.

Economists widely agree that if the price of human activities reflected all of the costs that they impose on society, including the above-mentioned costs⁴, environmentally damaging activities would decrease. In other words, "getting prices right," or providing the proper incentives to economic actors, is a big step in moving toward a more sustainable future.

The Torah supports this concept by teaching the importance of proper and "just" measurements in Lev. 19:36. "You shall have true scales, true weights, a true ephah (a unit of dry measure), and a true hin (a unit of liquid measure)." To do otherwise would be to commit a "perversion of justice." (Lev. 19:35)

3.2 Cost Effectiveness Principle

Once a particular environmental goal is set, the cost effectiveness principle demands that the goal is achieved at the lowest cost possible. Following this principle results in two benefits: it limits waste (i.e., excess expenditures to meet the goal), which, in turn, can make a policy more politically feasible.

An oft-cited environmental principle from Torah is Baal Tashchit, the prohibition against destructive waste. In Deuteronomy, chapter 20 deals with laws of warfare. Verses 19-20 state:

When in your war against a city you have to besiege it a long time in order to capture it, you must not destroy its trees, wielding the ax against them. You may eat of them, but you must not cut them down. Are trees of the field human to withdraw before you into the besieged city? Only trees that you know do not yield food may be destroyed; you may cut them down for constructing siege works against the city that is waging war on you, until it has been reduced.

Maimonides expands this prohibition against wastefulness in Mishneh Torah, Laws of Kings 6:10, in which he writes that Jews further should not destroy household goods, tear clothes, demolish buildings, stop up a spring, or purposefully ruin food. The economist's desire for efficiency is thus consistent with this admonition against wastefulness. Hillel (~110 BCE -

⁴ The full cost principle needs to also consider that the true costs of some activities may be under-reported due to inappropriate government subsidies - for example, when governments give free land concessions to logging companies, the price of their timber does not reflect the true value of the timber but is actually set too low. In Biblical times, however, this was not a relevant problem.

10 CE) famously re-frames the "Do unto others as you would have them do unto you," instruction by turning it into the negative form: "Don't do to others that which is hateful to you." This provides further emphasis on considering (and therefore minimizing) the costs of one's actions. (Wolff, 2012)

While the environmental economist would propose that cost effectiveness is best achieved through incentive-based programs (for example, pollution taxes or marketable pollution permits), solutions to environmental problems as seen in Jewish thought fall under the more costly "command and control" regulations. As mentioned earlier and elaborated in Oakman (1991), ancient economies were not well-suited for using market-based tools to change people's behavior. As Oakman reminds us, before the Industrial Revolution, economies looked very different from today's economic systems. Markets had a limited role in people's day-to-day lives, and trade arrangements were controlled by monarchs. For most people, agricultural activity was their mainstay, and most production was intended for home consumption. While households paid taxes, they were calculated in an unsophisticated way, with the purpose of raising revenue for public spending and redistribution (in addition to creating wealth for the rulers) but not influencing or curbing behavior.

In Kleiman's comments to Bava Kamma 116b, the above-cited question of how to compensate owners of ship cargo jettisoned to save the ship, he notes that obtaining efficiency is not the main goal of Talmudic decisions. Rather, distributive justice, or equity, is of paramount importance throughout the Talmud. Nevertheless, since owners of heavier items (therefore causing a greater risk of sinking), as opposed to more valuable items, had to pay a higher penalty suggests a consideration toward efficiency and not equity.

3.3 Property rights principle

Before discussing property rights and regimes, it may be helpful to define *property*. As clarified by Bromley (1992), property is a social construct that results in an accrual of benefits to the owner. A property right is "a claim to a benefit stream that the state will agree to protect..." (p. 2). Property rights regimes may be classified into four categories: private property, state-owned property, common property and open access property. Under stringent conditions, private property may be the best way to ensure environmental stewardship in today's society. When a person owns his property, he has the highest motivation to protect it from environmental degradation. This assumes (and this may be a strong assumption) that the owner uses the property for socially-useful production and in ways that do not harm society. Among land tenure regimes, common property - in which members of a community collectively own and manage a resource - was historically a sustainable practice. For example, consider communal property in traditional societies, in which all members of the society have a vested interest in protecting a resource. In today's world, however, population pressures and pressures from modernization (including political biases and encroachment of private property) have come to threaten these practices (Bromley, 1992).

In order for property rights to be effective, they must be exclusive, so that all of the benefits and costs of the property accrue to the owner; they must be transferable, so that the rights can be passed on or sold to another owner; and, they must be enforceable, so that no one can take another's rights by force (Bromley, 1992). Without these three conditions in place, a so-called property owner would have less incentive to protect his assets. For example, if an

owner is not assured that she will reap the benefits of an improvement that she pays for on her property, she may not make that investment. Similarly, if she is worried that her property may be unlawfully seized at any moment, it may not be worth it for her to try to improve it.

An added principle of property rights is that ownership of property (whether private, state or common) should be as close to the property as possible (Bromley, 1992). If local communities had the opportunity to derive direct benefits from the resources in their midst (for example, by owning a forest or the animals living within it), they would have a greater incentive to protect it. While the world as a whole might also benefit from that protection, the stewardship will be more effective at a local level.

In some cases, private, state or common ownership is logistically impossible, for example, in the case of ownership of the air. This class of property is referred to as “open access” (*res nullius*) resources, in which no one owns the property and therefore no one has an incentive to protect, preserve or otherwise sustainably manage it. In such instances, the government needs to provide incentives (either positive or negative) to protect the resources and distribute the benefits to the public. This assumes that the government keeps in mind local conditions and customs, as well as its own limited resources and capabilities.

Jewish commentary on property rights takes two forms: there is a theological perspective that all property belongs to God, but there are also laws designed to protect various property rights of people. In our analysis about what kinds of property rights are best for environmental stewardship, we will consider these two aspects in turn.

The Psalms are a good starting point for the theological perspective of ownership: Psalm 24 begins: “The earth is the Lord's, and the fulness thereof; the world, and they that dwell therein.” In other words, everything on the earth belongs to God and there is no such thing as private ownership by people. In that case, it would also call for the strong version of sustainability, since if we, as humans, do not own any resources, we cannot use them up nor attempt to replace them with substitutes. Psalm 115 modifies this concept of ownership slightly by saying, “the heavens (or the sky) belong to God but God has given the dry land to man.” If we were to accept the possibility that land (earth) can be possessed by humans, we might consider that humans will have an incentive to preserve their land. That will still leave the question of what would be people's incentive to protect the waters (not directly mentioned) and the air (under a loose interpretation that the air is part of the sky/heavens).

The Misheh Torah 13:12 provides some insights into the consequences for hurting someone accidentally (an “externality”) by suggesting that the “owner cannot be held liable by an earthly court.” In other words, God would mete out the punishment. This threat is one that may not be taken as seriously or literally in the modern world, as recognized in Pope Francis' 2015 encyclical, *Laudato Si'*, on the environment. The economist's answer to this is to treat God's property effectively like open access property – that is, property that no one owns and no one can be prevented from using (“non-excludable”). The solution to open access resources is to use government policy to preserve and protect the resource, through both regulations and price incentives (e.g., taxation and subsidies). The perhaps bold implication of this is that in the face of an open-access resource, a “higher authority” needs

to take control of it. If God is not the authority that humans are paying attention to, then the government has to take the authoritative role⁵.

On the other hand, there is no shortage of commentary and Jewish law on various types of property that do belong to people. Elman (2018/1958) summarizes Jewish law on property rights by noting there are three kinds of property: property that is owned by one or more persons (including common ownership); property that is “ownerless,” which is to say, it was once owned by someone, but that person either gave it up, lost it, died without an heir, or something similar; and, property that belongs to the Temple. These designations are referring to property that can be privately owned, as defined above.

Yet, there are examples of property that might be considered open access. In Bava Metzia 11a, the discussion surrounds how to assign ownership to wild animals or birds that cross one’s property. The answer has to do with whether or not the animal or bird is able-bodied or if it is wounded or unable to walk or fly away. The beginning verses of Chapter 21 in Deuteronomy discuss the problem of a dead body found on land that is in between two cities. Because no one owns the land where the body was found, the section discusses how to figure out who is responsible for it. In the end, the solution is to measure the distance from the body to each city and the closest city is the one that has to perform an odd ritual regarding the blood of a red heifer.

There is yet one more example of open access property, referred to above in the principle of the *migrash*. In Leviticus 25:34 and Numbers 35:1-15, the Levites are instructed to have two protected bands of land around their cities. The inner one is primarily to beautify the city with plants, but no agriculture or construction, while the outer band is for agriculture only. The rabbis in the Talmudic period decided that this rule should apply to all cities in Israel, not just those of the Levites (Arachin, 33b).

All of these examples provide evidence that even in Biblical times, open access land was considered important, while raising questions of whom to assign responsibility to.

Interestingly, the classic economics example of open access resources comes from the mid-19th Century economist William Forster Lloyd, who discussed the problem of livestock grazing on open land (then referred to as “the Commons”, but not to be confused with “common property” as described above). The so-called “Tragedy of the Commons” was then popularized by Hardin (1968) and is still regularly used in environmental policy and environmental economics courses today. This problem was already thought about by Maimonides in Hilchot Nizkei Mamon (damage to property): if an animal damages someone’s property (eg., fruit) the owner of the animal has to pay for the damage. This instance recognized that private property is key to avoiding damages.

⁵ This possibly heretical statement relies on the philosophy of Public Finance, the branch of Economics that analyzes government intervention in the economy. Such intervention is justified to correct for market failures that occur when the free market does not lead to the best outcome for society (Gruber, 2016). In a theological sense, this is also what a benevolent God does.

3.4 Sustainability principle

The sustainability principle ensures intergenerational equity; that is, that there is a fair distribution of resources between the current and future generations. Human nature, however, prevents this from occurring in a free market. After all, we are programmed to prefer the "here and now" to the future. That is why we need to be paid extra (ie., interest) to delay receiving and spending money immediately. This is partly due to our sense of instant gratification, but also due to the uncertainties that the future brings (e.g., what if I am saving for a tomorrow that never comes?).

This concept makes sure that decisions are based not just on weighing current costs and benefits but on all future ones as well. This calculation is complicated by the uncertainties associated with future cost-benefit flows as well as the need to account for the time value of money (and therefore, discounting future flows).

The Babylonian Talmud considers this aspect of making investments in nature whose "payoff" will not occur until future generations, as exemplified in Tractate Ta'anit 23a:

One day, [Honi the Circle Maker] was going along the road. He saw a man planting a carob tree. [Honi] said to him, "How many years does it take to bear fruit?" [The man] said to him, "Seventy years." [Honi] said to him, "Is it clear to you that you will live [another] seventy years?" [The man] said to him, "I found a world full of carob trees. Just as my ancestors planted for me, so I plant for my children." [Honi] sat down and ate. Drowsiness came to him. He fell asleep. A rock formation rose around him, he became hidden, and he slept for seventy years. When he rose, he saw that man picking [fruit] from [the tree]. [Honi] said to him, "Are you the one who planted [this tree]?" [The man] said to him, "I am his grandson." (Babylonian Talmud, Tractate Ta'anit 23a)

Honi's skepticism and doubt continue to modern generations and humans have already put intergenerational equity in peril. In order to move toward restoring some of that equity, some of the wealth we have accrued to-date needs to be transferred to future generations. The Alaska Permanent Fund (APFC, n.d.) is an example which weakly approximates such a transfer. It takes some of Alaska's oil revenues and invests them into a fund, whose returns are partially remitted to Alaskan citizens. In whatever form such a transfer take place, some level of government would have to take charge of this endeavor.

The rabbis did not have such a policy in place, but Midrash Kohelet Rabbah 7:13 contains an admonition from God:

When God created the first human beings, God led them around the Garden of Eden and said: "Look at my works! See how beautiful they are—how excellent! For your sake I created them all. See to it that you do not spoil and destroy My world; for if you do, there will be no one else to repair it."

This warning provides an awareness of the need to preserve resources for future generations, though it does not offer a way of ensuring sustainable behavior. In this passage, the punishment for not doing so is that neither God nor anyone else will come to the rescue. More generally, we see from chapter 28 in Deuteronomy the curses that will befall the

Israelites if they do not follow God's commandments. Most of these punishments start with consequences to the natural environment.

3.5. Information principle

People need to know why they should care about the environment. They need to understand why their individual actions matter and how their individual actions contribute to collective success. Following that, people need to understand which choices are sustainable and which are not.

Information can be shared through direct education, public awareness campaigns, environmental journalism, etc. The exact form of this information sharing is dependent on the environmental issue involved and on the resources (both financial and in terms of levels of personal income and education) within the location.

While the Torah and its commentaries do not specifically address the topic of "environmental education," so much of the history and culture of Judaism is enveloped in learning, that the information principle seems to hold in any context. From the regularly chanted "V'ahavta" prayer ("teach these words to your children," in Deuteronomy 6:7), to the teaching structure of the Passover seder, learning is everywhere in the Jewish tradition.

In modern times, a vast number of Jewish organizations are specifically devoted to environmental awareness, drawing upon many of the same texts analyzed in this paper. Designated environmental organizations, such as Hazon, COEJL, Jewcology, Aitzym, and Wilderness Torah are joined by other social justice organizations like Truah and the Religious Action Center in their pursuit of combining education and action. All denominations of Judaism include environmental programming, connected to Jewish sources and holidays. Thus, even if the sages of old did not explicitly specify it, modern Judaism practices the information principle with regard to building knowledge about the environment.

4. ASIDE ON "PUTTING A PRICE ON NATURE"

In order to make effective decisions about using or protecting the environment and natural resources, we have to put values on goods and services that are non-marketed. This raises both practical and ethical concerns. Economists have devised a variety of survey and statistical techniques to get around the question of *how* to measure items for which there is no market (Champ, Boyle & Brown, 2013). Of greater interest in this paper is the desirability to put a price on natural resources, human health, quality of life, etc. There is no shortage of critiques (Kelman, 2001; Sandel, 2013) of the economist's method of valuing precisely those parts of life which would be *de-valued* if we were to put a dollar figure on them.

Thus we must address such a concern, from the starting point that the use of dollars is merely a way of putting all values into a common denominator for the purposes of weighing difficult decisions. Indeed, in a world of constrained government budgets, policymakers must have some common medium of exchange to decide among competing projects. In reality, all of us at least implicitly put a value on many intangible items, including our own lives, such as when we decide to purchase a more fuel-efficient car, or pay extra for higher safety

standards on our household goods. No one is suggesting actually commodifying these resources, but from a practical perspective, decisions are more easily made if we can attempt to put values on all relevant components.

Jewish tradition supports this need to put a value on nature. This is seen in the Oral Law, as codified in the Mishnah, for example, where the literal words of the Torah are interpreted in a way to give clarity to society. For example, the phrase "an eye for an eye, a tooth for a tooth," (Exodus 21:24) is not meant literally, but rather, that a victim should be compensated for the *value* of what was lost to him or her.

Turning again to Baal Tashchit, commentaries by Rashi (1040-1105) and Ibn Ezra (1089-1167) suggest that valuing the environment is nothing new. These two scholars had different interpretations of the sentence: "Are trees of the field human to withdraw before you into the besieged city?" Rashi translates "ki" to mean "perhaps", as in "perhaps the tree is like a human" and so it should be protected. He suggests we would value the tree for its own sake. In economics terms, this is the concept of "existence value." Ibn Ezra interprets "ki" to mean "for" as in "for the trees of the field are human." In this view, the tree provides a livelihood or sustenance for humans. In economics, this is the idea of "use value:" we might be able to put a price on a non-marketed good, like a tree, by the worth of the goods and services it provides us (e.g., its fruit, its shade, its shelter for animals, etc.).

Lamm (1971) also discusses the concept of valuation in his commentary to Baal Tashchit. He notes that exemptions to the rule of not cutting down fruit trees include the possibility that the fruit of the tree isn't as valuable as the timber itself. If a fruit tree is of "inferior" quality and is damaging nearby, more valuable trees, it is also permissible to cut down the tree. These examples show that valuing nature helps to make practical decisions.

5. CONCLUSION

Mankind's anthropocentric view of the earth and our relationship to it, especially when it comes to the utilization of its natural resources, may be traced back to the Hebrew Bible. In Genesis 1:28, following the creation of humans, the text reads: "And God blessed them (humans); and said unto them: 'Be fruitful, and multiply, fill the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that creeps upon the earth.'" It is this verse which has paved the way for humans to see ourselves as the pinnacle of creation and masters of the planet

However, this concept contradicts our above review of Jewish concerns for the environment and its sustainability. It further suggests that our wanton behavior has rested on this one word "subdue," coming from the Hebrew *chiboosh*. Klein and Wasser (2010) agree that this is a misinterpretation, particularly following the commentaries of R. Obadiah b. Jacob Sforno (1475-1550) and Nachmanides. In their commentaries to Chapter 2, verse 19, they suggest that Adam does not assign names to each animal but rather "discovers" each name as he observes each animal. This suggests a sensitivity toward animals rather than dominion over them.

Given the lack of vowels in the written Torah, we propose a different pronunciation of this word, *chaboosh*, meaning "preserve." While this word is usually used in the context of preserving food, we would hope for a reinterpretation of verse 28 that we should preserve and sustain the earth, rather than subdue and dominate it. In this new context, modern

citizens today can see that the principles of the Hebrew Bible are wholly consistent with the policy proscriptions set out by environmental economists. It is our hope that with this recognition, it will make it easier for societies to make the changes necessary to protect and preserve the environmental and natural resources around us.

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