

## Ecosystem Services, Externalized Costs and the Cost of Doing Nothing – ChatGPT – 2/18/23

“I” = Interviewer, “G” = ChatGPT AI

**I:** Hi G, in our last discussion about adaptive management, you mentioned, "...the provision of critical ecosystem services." Let's talk a bit about ecosystem services and how they benefit mankind.

**G:** Certainly! Ecosystem services refer to the benefits that people obtain from natural ecosystems, such as food, water, air quality, soil fertility, climate regulation, and cultural values. These services are essential to human well-being and the economy, and are necessary for the functioning of our societies.

There are several types of ecosystem services, including:

1. Provisioning services: These are the products obtained from ecosystems, such as food, water, wood, and fiber.
2. Regulating services: These are the benefits obtained from the regulation of ecosystem processes, such as climate regulation, water purification, and erosion control.
3. Cultural services: These are the non-material benefits obtained from ecosystems, such as recreation, spiritual and religious values, and aesthetic values.
4. Supporting services: These are the services necessary for the production of all other ecosystem services, such as nutrient cycling, soil formation, and primary production.

Ecosystem services are particularly important for people living in poverty, as they rely heavily on natural resources for their livelihoods. For example, many communities in developing countries depend on forests for fuel, food, and medicine. Ecosystem services are also important for sustainable development, as they provide the foundation for economic growth while maintaining the integrity of the natural environment.

In summary, ecosystem services are essential for human well-being and are vital for the functioning of our societies. Understanding the importance of these services is crucial for ensuring that we manage and use our natural resources in a sustainable way.

**I:** Let's do a thought experiment and imagine a world in which many ecosystem services have been allowed to deteriorate and become nonfunctional. What might that world be like?

**G:** In a world where many ecosystem services have deteriorated and become nonfunctional, the consequences could be severe and far-reaching. Some potential impacts could include:

1. Food insecurity: Many people around the world depend on wild-caught fish, crops grown in healthy soils, and pollination by insects to produce food. If these ecosystem services decline or disappear, it could result in food shortages, malnutrition, and even famine.
2. Water scarcity: Ecosystems play a critical role in regulating the water cycle, ensuring that there is enough clean water for human use. If these services deteriorate, it could lead to water scarcity, decreased water quality, and increased risks of waterborne diseases.

3. Increased risk of natural disasters: Ecosystems help to mitigate the impacts of natural disasters such as floods, droughts, and landslides. If these services deteriorate, it could increase the risk of such disasters and result in property damage, loss of life, and economic instability.
4. Loss of biodiversity: Ecosystem services are essential for the survival and well-being of many species, and the loss of these services could lead to the extinction of many plants and animals.
5. Economic instability: Many industries rely on ecosystem services, such as tourism, agriculture, and forestry. If these services decline, it could lead to economic instability and the loss of jobs.

Overall, a world in which many ecosystem services have deteriorated and become nonfunctional would be one characterized by significant challenges to human well-being and sustainable development. It is crucial that we take steps to protect and restore these critical services.

**I:** Talk a bit about the economic consequences of allowing ecosystem services to degrade.

**G:** The economic consequences of allowing ecosystem services to degrade can be significant, both in the short and long term. Some potential impacts could include:

1. Loss of economic productivity: Ecosystem services, such as soil fertility and water regulation, are essential for many economic activities, such as agriculture, forestry, and fisheries. If these services deteriorate, it could result in decreased productivity, lower yields, and increased costs for businesses.
2. Increased healthcare costs: Degradation of ecosystem services, such as air and water quality, can lead to increased rates of illness and disease. This can result in higher healthcare costs for individuals, businesses, and governments.
3. Higher infrastructure costs: Ecosystem services, such as flood regulation and erosion control, can help to reduce the risk of damage to infrastructure. If these services deteriorate, it could result in higher infrastructure costs for businesses and governments.
4. Reduced tourism revenue: Many tourists are attracted to natural landscapes, such as beaches, forests, and national parks. If ecosystem services, such as the maintenance of biodiversity, are not protected, it could lead to the loss of tourism revenue for businesses and governments.
5. Reduced quality of life: Ecosystem services, such as clean air and water, contribute to the quality of life of individuals. If these services deteriorate, it could result in decreased quality of life, which can have indirect economic impacts, such as reduced worker productivity and lower social cohesion.

Overall, the economic consequences of allowing ecosystem services to degrade can be significant and wide-ranging. It is crucial that we understand the economic value of these services and take steps to protect and restore them.

**I:** The deforestation of the Amazon rainforest may be an example of depleting the ecosystem's ability to provide services. What would you say are the most pressing consequences of that degradation?

**G:** Deforestation of the Amazon rainforest is a significant example of ecosystem service degradation, and it has numerous pressing consequences, including:

1. **Loss of biodiversity:** The Amazon rainforest is one of the most biodiverse regions on the planet, with millions of plant and animal species. Deforestation can lead to the extinction of many species, and the loss of biodiversity can have cascading effects on ecosystems.
2. **Climate change:** The Amazon rainforest plays a critical role in regulating the Earth's climate by absorbing and storing carbon dioxide. Deforestation can lead to increased greenhouse gas emissions, which can contribute to climate change.
3. **Water scarcity:** The Amazon rainforest also plays a critical role in regulating the water cycle, helping to ensure that there is enough clean water for human use. Deforestation can lead to decreased water availability and increased risks of waterborne diseases.
4. **Soil degradation:** Trees and other plants in the Amazon rainforest help to maintain soil fertility and prevent erosion. Deforestation can lead to soil degradation, which can result in decreased agricultural productivity and increased costs for farmers.
5. **Displacement of indigenous communities:** The Amazon rainforest is home to many indigenous communities who rely on the forest for their livelihoods and cultural identity. Deforestation can lead to the displacement of these communities and the loss of their traditional knowledge and practices.

Overall, deforestation of the Amazon rainforest has numerous pressing consequences, and it is crucial that we take steps to protect and restore this critical ecosystem. This includes initiatives to promote sustainable land use practices, protect biodiversity, and support the livelihoods of indigenous communities.

**I:** But what about the economic cost of conserving the Amazon forests to preserve the services it supplies? Does that cost exceed the cost of doing nothing?

**G:** The economic cost of conserving the Amazon rainforest is a complex issue, and there is debate about whether the costs of conservation exceed the costs of doing nothing. However, several studies have shown that the economic benefits of protecting the Amazon rainforest are substantial and may outweigh the costs of conservation.

For example, the Amazon rainforest is a crucial carbon sink, absorbing and storing large amounts of carbon dioxide, and providing a valuable service in mitigating climate change. A study by the United Nations estimated that the economic benefits of carbon sequestration and storage in the Amazon rainforest could be worth up to \$1.7 trillion over the next 20 years, which is greater than the cost of protecting the forest.

The Amazon rainforest is also a vital source of biodiversity and genetic resources, which are essential for many industries, including pharmaceuticals, cosmetics, and agriculture. According to the World Wildlife Fund, the Amazon rainforest provides ecosystem services worth an estimated \$8.2 billion annually, which includes the provision of freshwater, flood control, and pollination.

Furthermore, the Amazon rainforest is also an important source of livelihood for many local communities who rely on the forest for their survival. Conservation initiatives that promote sustainable land use practices, protect biodiversity, and support the livelihoods of local communities can have positive economic and social impacts, including increased incomes and improved access to healthcare and education.

Overall, the economic benefits of protecting the Amazon rainforest are substantial and may outweigh the costs of conservation. It is essential to consider the long-term economic and social impacts of deforestation and the benefits of preserving the critical ecosystem services that the forest provides.

**I:** And can the same be said about ecosystem conservation in other places? Is the cost of destroying ecosystems like the Verde River more than the cost of replacing the ecosystem services it supplies?

**G:** The cost of destroying ecosystems like the Verde River can be significant and may exceed the cost of replacing the ecosystem services it supplies. Ecosystems provide numerous services, including water purification, flood control, and the provision of habitat for plants and animals, which can have significant economic and social value.

For example, the Verde River in Arizona provides important ecosystem services, including water supply for agriculture, recreation, and tourism. A study by the Sonoran Institute estimated that the Verde River provides ecosystem services worth an estimated \$600 million annually, including the provision of water for agriculture and other uses.

Furthermore, the destruction of ecosystems can have significant economic and social costs. For example, the loss of habitat can result in the extinction of species and the loss of genetic diversity, which can have long-term consequences for the sustainability of ecosystems and the services they provide. Additionally, the loss of ecosystems can result in increased risks of natural disasters, such as flooding, which can result in property damage, loss of life, and increased insurance costs.

Therefore, it is important to consider the economic and social costs of destroying ecosystems and the benefits of preserving and restoring them. In some cases, the costs of conservation and restoration may be lower than the costs of doing nothing or allowing ecosystems to degrade further. It is important to conduct economic assessments and consider the long-term economic, social, and environmental impacts of conservation and restoration initiatives.

**I:** Why, then, is it so difficult to find funding for conservation programs that will help preserve the ecosystem services of the Verde?

**G:** The difficulty in finding funding for conservation programs to preserve the ecosystem services of the Verde River and other ecosystems is due to several factors, including:

1. Lack of awareness: Many people may not be aware of the importance of ecosystems and the services they provide. There may be a lack of understanding of the economic and social value of preserving ecosystems and the potential consequences of their degradation.

2. Short-term thinking: Many conservation initiatives require long-term investments and may not have immediate or visible benefits. This can make it difficult to convince funders to invest in conservation programs, especially if they are more focused on short-term gains.
3. Conflicting priorities: Funding for conservation programs may compete with other priorities, such as infrastructure development or economic growth. There may be a perception that conservation initiatives are a luxury that can only be afforded once other priorities have been addressed.
4. Limited resources: Funding for conservation programs may be limited, and there may be many competing demands for available resources. This can make it difficult to allocate resources to conservation programs, especially if they are competing with other pressing needs.

To address these challenges, it is important to increase awareness of the importance of ecosystems and the services they provide, promote long-term thinking and planning, and foster collaboration between stakeholders. Governments, non-governmental organizations, and other actors can work together to identify opportunities for funding conservation programs and develop innovative financing mechanisms, such as conservation finance and impact investing, to support conservation initiatives. Additionally, it is essential to ensure that conservation programs are designed and implemented in a way that maximizes their economic, social, and environmental benefits and generates measurable and tangible results.

**I:** But is it really "a luxury that can only be afforded once other priorities have been addressed" if the cost of doing nothing exceeds the cost to our future economy and society?

**G:** You are correct that viewing conservation initiatives as a "luxury" that can only be afforded once other priorities have been addressed is a flawed way of thinking, particularly if the cost of doing nothing exceeds the cost of preserving and restoring ecosystems.

In many cases, conservation initiatives can provide significant economic and social benefits, including improved water quality, increased biodiversity, and enhanced recreational and tourism opportunities. These benefits can lead to economic growth, job creation, and other positive outcomes.

Additionally, the cost of not investing in conservation initiatives can be significant. The degradation of ecosystems can lead to the loss of important ecosystem services, such as water filtration and flood control, which can result in increased costs and reduced economic productivity. Degradation can also lead to the extinction of species, loss of genetic diversity, and reduced ecosystem resilience, which can have long-term consequences for the sustainability of ecosystems and the services they provide.

Therefore, it is important to view conservation initiatives not as a luxury but as an essential investment in the long-term sustainability of ecosystems and the economic and social benefits they provide. This requires a shift in thinking and a willingness to prioritize conservation and restoration initiatives, even when resources are limited and there are other pressing needs.

How can we quantify the costs, both of doing nothing (or not enough) and the cost of active intervention to preserve ecosystem services?

Quantifying the costs of doing nothing or not enough to preserve ecosystem services and the costs of active intervention to preserve these services can be a complex process, as it requires consideration of multiple factors and uncertainties.

One approach is to conduct a cost-benefit analysis, which compares the costs and benefits of different management options, including doing nothing or not enough and taking active measures to preserve ecosystem services. In this analysis, the costs and benefits of each management option are evaluated and expressed in monetary terms, allowing for a comparison of the economic costs and benefits of different management strategies.

The costs of doing nothing or not enough can include direct costs, such as the costs associated with damage to infrastructure or the loss of natural resources, as well as indirect costs, such as the loss of ecosystem services or the costs associated with adapting to changing environmental conditions.

The costs of active intervention can include the costs of implementing management strategies, such as the costs of restoration or conservation measures, as well as the costs associated with monitoring and evaluating the effectiveness of these strategies.

The benefits of preserving ecosystem services can also be quantified in monetary terms, and may include direct economic benefits, such as increased agricultural productivity, as well as non-monetary benefits, such as improved public health or increased biodiversity.

It is important to note that there may be limitations to this approach, as not all costs and benefits can be easily quantified, and there may be uncertainties associated with the estimates of these costs and benefits. Nevertheless, conducting a cost-benefit analysis can be a useful tool to inform decision-making and help identify the most effective and economically efficient management strategies for preserving ecosystem services.

**I:** What about the fact that ecosystem degradation costs are often externalized, rather than paid by the entities that are causing those costs? Who pays these externalized costs?

**G:** You raise an important point. In many cases, the costs of ecosystem degradation are not borne by the entities that cause them, but are instead externalized to society as a whole. This is often referred to as the problem of externalities.

Externalities occur when the costs or benefits of an economic activity are not fully reflected in the prices that are paid by the buyers and sellers in the market. For example, a company that pollutes a river may not bear the full costs of that pollution, such as the costs of cleaning up the river or the health costs associated with exposure to the pollution. Instead, those costs are borne by society as a whole, including individuals who may not have any direct relationship with the company or the river.

The problem of externalities is a significant challenge in managing ecosystems and preserving ecosystem services. When the costs of ecosystem degradation are externalized, it can be difficult to

incentivize the entities that are causing the degradation to change their behavior. This can lead to a situation where ecosystem degradation continues, even though the costs of that degradation may be high.

One approach to addressing this problem is to internalize the costs of ecosystem degradation, by requiring the entities that cause the degradation to bear the full costs of their actions. This can be done through mechanisms such as pollution taxes or cap-and-trade systems, which require companies to pay for the environmental costs of their activities.

Another approach is to use economic incentives to encourage the preservation of ecosystem services, such as payments for ecosystem services, which provide financial incentives to landowners and other stakeholders to protect and restore ecosystem services.

Ultimately, addressing the problem of externalities is a complex challenge, and will likely require a range of strategies, including regulatory approaches, economic incentives, and public education and outreach, to ensure that the costs of ecosystem degradation are fully internalized and the benefits of ecosystem services are fully realized.

**I:** One argument is that if we force businesses to pay the full cost of their externalizations, it will damage the economy. Is that a valid concern, or is it just short-term vs. long-term thinking?

**G:** The argument that forcing businesses to pay the full cost of their externalizations will damage the economy is a complex issue that depends on many factors, including the specific externalities in question and the economic context in which they occur.

In the short term, it is possible that internalizing the costs of externalities could increase costs for businesses, which could reduce profits and lead to job losses or other negative economic consequences. However, it is also important to consider the long-term economic costs of not addressing externalities, which can include damage to public health, ecosystem services, and other natural resources that are essential to the functioning of the economy.

In some cases, internalizing the costs of externalities can actually lead to more efficient and sustainable economic outcomes in the long run. For example, if a company that pollutes a river is required to pay the full cost of that pollution, it may have an incentive to invest in more efficient production processes or technologies that reduce pollution, which could lead to cost savings and a more sustainable business model over the long term.

Moreover, internalizing the costs of externalities can also create opportunities for new businesses and industries that specialize in providing environmentally friendly goods and services. For example, the development of renewable energy technologies has created new jobs and industries in many parts of the world, and has the potential to drive economic growth in the long term.

In summary, the concern that internalizing the costs of externalities will damage the economy is a valid concern, but it is important to consider both the short-term and long-term economic costs and benefits of addressing externalities. In many cases, internalizing the costs of externalities can create

new opportunities for sustainable economic growth and development, while also preserving the natural resources and ecosystem services that are essential to the functioning of the economy.

**I:** Expand a bit on the benefits of internalizing externalities.

**G:** Internalizing externalities, or making businesses pay the full cost of the negative impacts they have on the environment and society, can have a number of benefits.

First, it can help to correct market failures. When businesses do not bear the full costs of their actions, they may engage in behavior that is socially and environmentally harmful. Internalizing externalities can help to ensure that the true costs of goods and services are reflected in market prices, which can encourage more sustainable and socially responsible behavior.

Second, internalizing externalities can encourage innovation. When businesses are forced to pay for the negative impacts of their actions, they may have an incentive to develop new, more sustainable technologies and practices that can help them reduce those impacts. For example, a carbon tax can encourage businesses to invest in renewable energy and energy efficiency technologies that can help them reduce their carbon emissions.

Third, internalizing externalities can create new business opportunities. As society becomes more concerned about environmental and social issues, there is growing demand for goods and services that are produced in a more sustainable and socially responsible way. Businesses that can meet this demand can benefit from new market opportunities and gain a competitive advantage.

Finally, internalizing externalities can help to preserve natural resources and ecosystem services, which are critical for the long-term health and sustainability of the planet. By forcing businesses to pay for the true cost of their actions, we can help to ensure that natural resources and ecosystem services are used in a sustainable way, and that they will be available for future generations.

Overall, internalizing externalities can help to create a more sustainable, equitable, and prosperous society. While there may be short-term costs associated with internalizing externalities, the long-term benefits can be significant, both for businesses and for society as a whole.

**I:** You mentioned, "socially responsible behavior" as a goal of internalizing externalities. Isn't "responsible behavior" in the eye of the beholder, so to speak?

**G:** You are correct that what constitutes "responsible behavior" can be subjective and may depend on cultural, social, and economic factors. However, there are certain actions that are widely recognized as being socially responsible, such as reducing greenhouse gas emissions, conserving natural resources, protecting biodiversity, ensuring fair labor practices, and promoting human rights.

In the context of internalizing externalities, the goal is not necessarily to dictate specific actions or behaviors, but rather to ensure that businesses are held accountable for the negative impacts of their actions and have an incentive to act in a socially and environmentally responsible manner. This can



be accomplished through a variety of mechanisms, such as regulation, taxes, market-based incentives, and voluntary initiatives.

The specific policies and approaches used to internalize externalities may vary depending on the specific context, but the overall goal is to encourage businesses to act in a way that is more sustainable and socially responsible, while also ensuring that the true costs of goods and services are reflected in market prices.

**I:** Yes, I agree that "...the goal is not necessarily to dictate specific actions or behaviors." That leaves room for innovation, as you said above, new jobs, new investment opportunities, etc. Right?

**G:** Yes, that's correct. By internalizing externalities, businesses are encouraged to find new and innovative ways to reduce their negative impact on the environment and society. This can lead to the development of new technologies, products, and services that can create new markets and business opportunities, as well as new jobs and investment opportunities.

For example, if a carbon tax were implemented to internalize the external cost of carbon emissions, businesses would have an incentive to find ways to reduce their carbon footprint. This could lead to the development of new renewable energy technologies, such as solar or wind power, which can create new jobs and investment opportunities in those industries. It could also lead to the development of new energy-efficient technologies, such as electric cars or more efficient buildings, which can create new markets for those products.

Overall, by internalizing externalities, we can create a more sustainable and socially responsible economy, while also fostering innovation, job creation, and economic growth.

**I:** That's a good place to leave it, I think. Food for thought!

**G:** I'm glad our discussion was thought-provoking! If you have any other questions or want to continue the conversation, feel free to ask.