ENVIRONMENTAL ECONOMICS IN THE EIA PROCESS

Strong economies are essential for ensuring that the basic needs of humans are met. Meeting these needs is a challenge in the developing countries of the Mekong River Basin (MRB), where a vast majority of people strive for daily survival. However, current patterns of economic growth are causing significant environmental problems. The serious ecological consequences of past (and ongoing) economic activities threaten human health and the long-term health of the natural environment (e.g., air pollution, climate change, resource depletion, toxic chemicals). Consequently, it is imperative that the traditional economic development paradigm is modified to ensure that development contributes positively to social well-being in a way that does not jeopardize human and environmental health.

Perhaps one of the most significant lessons to take from this lesson will be the fact that the ability of the natural environment to meet humans' energy

and resource demands is limited. We live in a world with finite resources and ecological capabilities. It is therefore essential that economic activity occur within the Earth's ecological limits. Think of it like this: we can harvest the natural resources that we need, like timber and fish. We can also dump our wastes into landfills and watercourses. Yet the Earth's capacity to meet our resource harvesting and waste disposal needs has limits. Here are a couple of simple illustrations of these relationships, and how we can live within natural environmental limitations:

$$H < Y$$

Harvest (H) is less than yield (Y). This ensures a renewable supply of the particular resource, as the rate of harvest is kept below the rate of natural regeneration.

$$W < A$$

Where waste flows (W) are less than the natural environment's capacity to assimilate (A) that waste. Keep in mind that yield (Y) and assimilative capacity (A) are not static; we can manage natural resources to improve sustained yield and waste assimilation capacity.

In principle, economic analysis of a development activity such as an industrial project takes into account all the benefits and costs of the activity. In reality though traditional economic analysis is unable to account for the costs of adverse environmental impacts. This is because environmental impacts are often so difficult to physically measure and quantify. Also, even if we could quantify a particular environmental impact, valuation in monetary terms is often difficult. In this lesson, we will examine weaknesses of traditional economic theory relating to the valuation of environmental impacts related to development projects subject to environmental

impact assessment (EIA). We will also look at some alternative methods for the incorporation of environmental costs into the overall EIA approval decision.

CLASSICAL ECONOMIC THEORY AND PRACTICE

Classical economic systems are based on relationships between demand and supply. The price of a good or a service is dependent upon both the demand for a product and product supply. The higher the demand there is for a product, the higher its price. The relationship is the reverse for supply: the higher the supply, the lower the price.

Based on market dynamics, the price of a commodity will fluctuate until it reaches its equilibrium price – the point at which demand equals the supply. For example, if supply exceeds demand the price of the good will decrease. This, in turn, will decrease the supply. Conversely, if demand exceeds supply, the higher price for the product will encourage greater production leading in turn to increased supply and, ultimately, lower prices.

The basic assumption of classical economics is that markets will respond in such a way as to achieve optimal levels of supply and demand. Scarce resources will command higher prices which in turn, will lead to a lower demand and encourage industry to look for substitute products. However, the fact remains that current patterns of economic activity are degrading the environment. If economic systems strive to optimize demand with supply, then why is environmental degradation occurring? The following section provides a brief overview of some of the key limitations of the classical economic market and how these failings have enabled continual deterioration of our environment.

FAILURES OF THE CLASSICAL ECONOMIC MARKET

Price Versus Value: The Water and Diamond Paradox

Water is a necessity of life – without it, humans cannot survive. Diamonds are a luxury, an unnecessary commodity. Why is it then that diamonds are expensive and water is relatively cheap? The answer lies in the way that conventional economic practice assigns worth.

In discussing value, early economists distinguished between ‘value in use’ and ‘value in exchange’. Unfortunately, as economic theory developed, the ‘value in use’ component became increasingly ignored and value became progressively defined in terms of only ‘value in exchange’. Consequently, today’s conventional economic analysis considers the value of a commodity to be the quantity of money for which a commodity can be exchanged. The use value of a commodity is ignored.

Another difficulty of equating worth with only exchange value is that conventional economic analyses ignore the costs and benefits of non-market goods – those that cannot be exchanged, such as certain natural resources. With natural resources falling outside of an organized market, market prices cannot be set and economic valuation becomes difficult. For example, timber can be readily valued in terms of market prices. However, lacking direct exchange value, the worth of resources such as forest habitat and associated biodiversity is ignored by conventional economics.

Consequently, these types of attributes have historically been excluded from timber management plans and environmental assessments. True markets will probably never emerge for natural resources, and even if they did, they probably could not function efficiently. The end result of this situation is that natural resources are underpriced, which only leads to overconsumption and wasteful use.

By acknowledging that the classical economic model omit important goods like ecosystem functions, governments in the Lower Mekong Basin (LMB) can begin to develop strategies for incorporating the value of non-market goods into decision making. For instance, where no true market price exists, it is possible to approximate social value by inferring what consumers would be willing to pay for the product or services; for example, the willingness of visitors to pay for forest-based recreation or hunting and fishing. However, this approach still fails to account for the value to local communities who rely on resources for their livelihood. Instead, value is solely based on individual consumer perspective. Monetary valuation is even less appropriate for many other non-market goods and services. For example, it is difficult to imagine attaching any meaningful monetary value to 'goods' such as biodiversity, cultural integrity, scenic landscapes and spiritual well-being.

Externalities

Another significant failing of conventional economics is its inability to address externalities. Externalities occur when the complete set of benefits and costs of undertaking a project are not incorporated into the pricing system. The pricing system may fail to compensate for a loss or to realize a benefit. In either case, the project's true costs and benefits are not realistically represented in the economic decision-making process. This often leads to negative impacts on the environment.

For example, the cost of fertilizing agricultural lands is determined by two factors: the cost of the fertilizer product and the cost of the labor required to apply the fertilizer. The decision on whether to apply fertilizer is determined by weighing these costs against the anticipated benefits of increased agricultural productivity. However, many costs associated with applying the fertilizer have not been considered. For instance, what about the costs associated with lethal impacts to local wildlife, including birds and fish, and the loss in food and income to local communities who depend upon these resources? Costs associated with potential groundwater contamination and related human health effects are also excluded. Such costs are examples of externalities. When externalities exist, the project proponent or entity undertaking an activity realizes total benefits (e.g., increased income from increased food supply) while only paying a portion of the costs. Because total benefits are only compared to partial costs, activities may still proceed even when total costs exceed total benefits.

Myopia (Short-Sightedness): Discounting the Future

Conventional economic decision making is biased against the future. Money today is worth more than money in the future. This is because today's money can be invested for further gains. Consequently, a dollar today is worth more than a dollar earned 50

years from now. The process of assigning the future less value than the present is termed discounting. We discount because, as humans, we tend to prefer our benefits now rather than later.

Economic trade-offs are made by the current generation participating in today's markets. Because they are not participating in the market, interests of future generations may be given less weight (i.e., be considered less important in making today's decisions). For example, productivity in the year 2075 is of utmost concern and value to the people living at that time. However, a farmer considering the value in spending money for soil conservation is much less concerned about productivity value in 2075 than he or she is about today's soil productivity and income generated over his or her lifetime.

For resources that regenerate slowly, such as wildlife populations or tropical forests, the process of discounting can even encourage resource depletion. The period over which conservation measures would prove worthwhile by providing additional resources for future consumption is very long – well beyond the period considered by most people in deciding how to spend their money or use resources to earn money. Under these circumstances it might make more sense from a purely economic perspective to purposely deplete a resource as fast as possible even though such an action would be highly undesirable from an ecological perspective as illustrated in Figure 1.

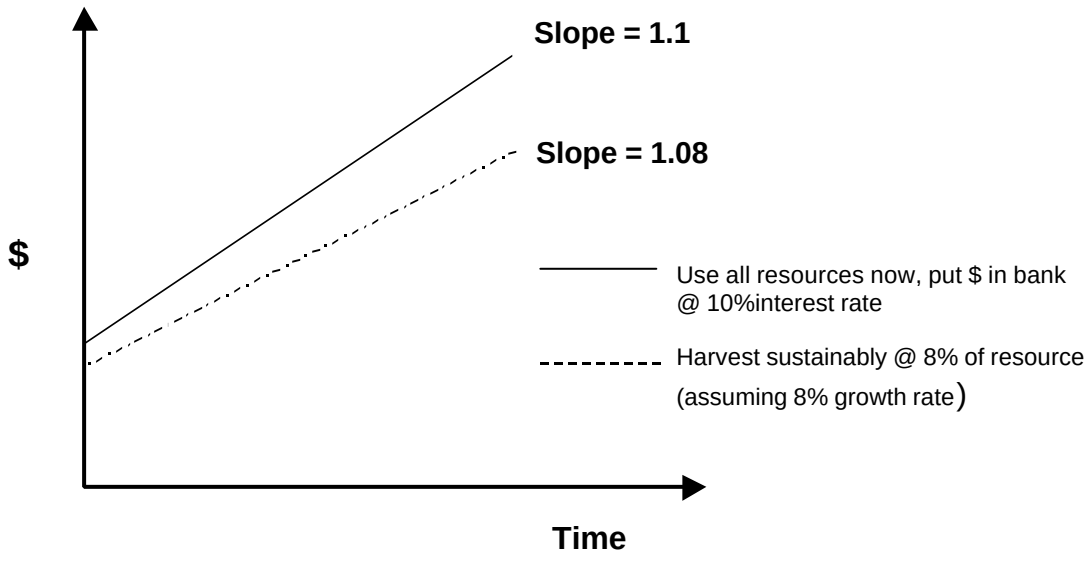

Figure 1 Discounting

This course of action would enable resource users to maximize their profits by reinvesting their derived income for additional gains. Although only hypothetical, this example does clearly illustrate how obviously unsustainable resource use decisions could be made if the only decision criteria was investment optimization. In this situation the needs of the future are of lower priority and, therefore, are not fully considered in making development decisions.

Common Resources: 'Tragedy of the Commons'

It is widely acknowledged that individuals pursuing their own interests often produce unacceptable collective effects on shared resources. Common resources are those that are not formally owned and are publicly available for use by anyone, such as reservoir fisheries, grazing pastures and forest wildlife.

While aiming to maximize immediate individual benefits, users of common resources usually fail, in the short term, to assume the full cost of their actions. As a result, under unregulated conditions, resource degradation inevitably occurs. For example, it is in the best interests of individual fishers to maximize their total catch even when this activity could threaten the overall health of the fish population. Each fisher gains the entire income earned by the maximum fish caught today but passes on the ultimate cost of their overfishing (i.e., resource depletion) to all others involved in the fishery.

The paradox in this fishing example is that it makes no economic sense for an individual fisher to restrict their catch unilaterally. If a fisher chose to refrain from catching additional fish in the interest of protecting the fish population, they would not only lose the immediate benefit of additional income, but would still share the eventual collective cost of overfishing (i.e., no fish to catch). This is because the remaining fishers would likely continue to maximize their fish yields, perhaps even catching the extra fish that were left behind for stock protection. Consequently, although no individual wants depletion to occur, human behaviour dictates that individual actions will combine to result in this collective effect. This is why it is so important to evaluate the real social need and benefit of a proposed project during the EIA process. Too often project proponents enjoy the exclusive benefit of the resource being developed without adequately compensating local communities or natural ecosystems.

THE CONNECTION BETWEEN THE ECONOMY AND THE ENVIRONMENT

Factories pay workers through wages that then enter households. Households purchase products and services from factories. Factories also borrow savings from banks to pay for investments, and in turn, pay interest to banks. This model clearly illustrates the economic relationships which exist in a traditional developed economy. However, it completely ignores the physical aspects of the economy. Where do raw materials used by factories come from? Where does the energy to make products and deliver services come from?

A new picture of the economy, one which addresses these questions and recognizes the physical aspects of the economy, is shown in Figure 2.

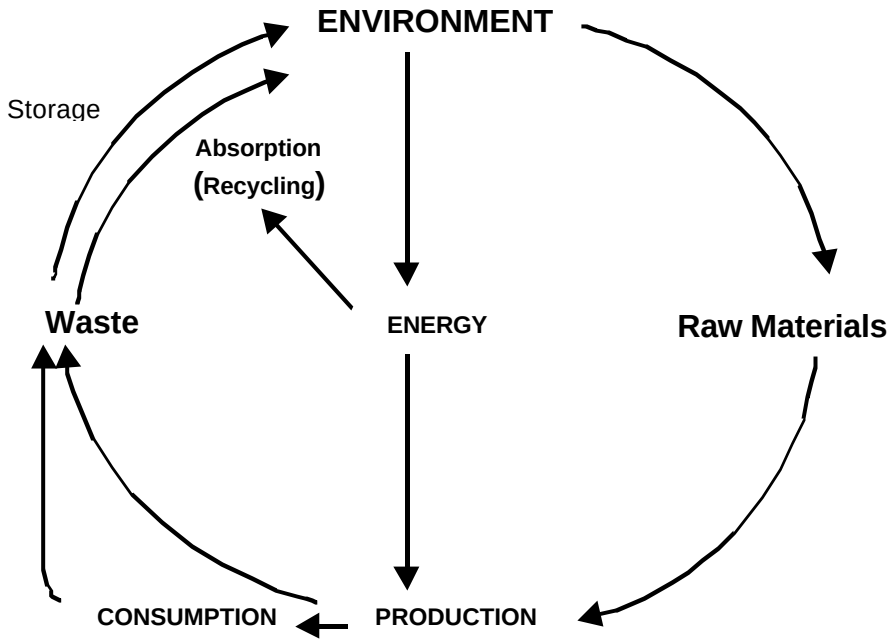

Figure 2 A new ecology-based model of the economy

Depicting the economy via exchanges of matter and energy, this 'thermodynamic' model clearly demonstrates the interdependency of the economy and the environment. Re-thinking the traditional income flow model and adopting a new perspective, which acknowledges the relationship between the economy and environment, is essential for moving towards sustainable development and wise management of natural resources. Most importantly, adopting an economic perspective that acknowledges the interdependent relationship of the economy and the environment would finally help mobilize society and overcome the current obstacles caused by continual arguments which set economical and environmental needs against each other.

Preserve Natural Capital

Economic success is of little social value if it is achieved simply by depleting reserves or productive capacity. For example, income flow for a household cannot be regarded as economic success if it is solely derived from using up household savings – at some point the savings (i.e., capital) will run out and there will be no income at all. The same principle can be applied to natural resources. If a forest is sustainably logged for timber and this activity impacts the future capacity of the forest to regenerate and produce more timber, eventually income derived from timber use will cease. Conversely, if the forest is logged in a manner that maintains forest productivity, timber supplies will continue and income sources will be secured over the long

term. The key is to protect the natural capital base, the ecological capacities of systems to regenerate, and to mold economic activity in order that each generation is solely living off the 'interest' of natural resources.

Conduct Full-Cost Accounting and Ensure Equity

Addressing externalities and incorporating the full costs of economic activity is essential. Strategies must be incorporated that recognize the true value of goods and services (i.e., both use and exchange value) and ensure that non-market goods that are difficult to value under current monetary valuation system are adequately recognized in the decision-making process. It is also vital that consideration be given to ensuring the equitable division of costs and benefits. Specifically, this means ensuring that the full costs of activities are borne by persons or industries who gain the benefits. The policy of 'polluter pay' is an example of this principle of adopting long-term protection of future generations.

Green accounting is another method of incorporating environmental costs into a country's national accounts. Green accounting is the practice of deducting environmental costs from a country's gross national product (GNP). This method can indeed help in reducing the overuse of resources, and their excessive extraction, by reporting the costs from extractions more accurately.

ECONOMIC ASSESSMENT OF ENVIRONMENTAL IMPACTS

The economic evaluation of environmental impacts is important in the overall EIA process, as it can reveal whether the net benefits of undertaking a project or activity are greater than the alternatives, including the no-project alternative. Economic assessment of different alternatives in the early stages

Issues in the Economic Evaluation of Environmental Impacts

Economic analysis has some limitations when incorporating the environmental values into benefit-cost analysis.

Income distribution: Projects which will benefit wealthy companies or individuals at the expense of poor individuals or villages may be undesirable, even if they show high benefit-cost ratios.

Intergenerational equity: Future generations might have fewer resources available than they would have had without the project, resulting in a high benefit-cost ratio. The discount rate is particularly important to consider, as a high discount rate will favor projects with immediate net benefits, while a low one will give more weight to negative future impacts. The environmental impacts of a project could be highly affected by this issue, as some of the environmental impacts may be felt over a long period.

Risk and uncertainty: Natural events such as droughts, floods, earthquakes and plant and animal diseases may seriously affect projects. To address this problem, expected values are used as alternative values for variables, for example, current prices can be used for quantities whose precise value cannot be known in advance.

Accounting for irreversible damage: Decision makers must give special attention to irreversible impacts to natural resources since these may have significant consequences in the future. In general, if the costs of retaining a resource that would otherwise be lost are relatively low, then decision makers should make every effort to protect the resource. Caution is required in the evaluation of proposed projects, with an emphasis on the wise use of non-renewable resources and the selection of projects that promote sustainable use of renewable resources.

of project planning can provide important insights to improve the quality of decision-making. Almost certainly, not all environmental impacts and trade-offs can be given a monetary valuation or a fair economic assessment. However, if environmental managers and decision makers in MRB riparian countries can begin to think about how environmental actions do carry hidden costs, they will be better able to select the environmental consequences that they are willing to accept. Available methods for the economic valuation of environmental impacts are briefly examined in the following section.

Opportunity Costs

The opportunity cost approach can be an effective method for determining the value of a natural resource, and therefore the environmental cost of losing that resource. The opportunity cost is essentially the value of the best alternative forgone. For example, consider a hydropower project that would require the flooding of several hundred acres of wetland. This wetland might be exceptional aquatic habitat, but its value as habitat may be difficult to determine. Instead of considering loss of that wetland as having no real economic impact, we could place a value on the land based on its expected crop revenues if the land were to be put into cultivation. Here, the market price of crops could be used to place an economic value on the land. The crop revenue figure could then be used as the economic cost of losing the wetland to the dam/reservoir project.

The obvious flaw in this scenario is that ecologically-important wetland might still be lost, but at least some monetary value is attributed to the wetland in making the decision to proceed or not to proceed with the hydropower project.

Surrogate Market Prices

Surrogate market techniques are approaches that use actual market prices to value an unmarketed quality of the environment such as clean water, clean air or aesthetics. The basic assumption is that the purchaser's valuation of the environmental quality of concern is the price differential arrived at after all variables except environmental quality have been controlled. As an example, consider urban property values. In general, we can assume that the price a buyer is willing to pay for a property reflects all the attributes of the property which they value, including perhaps a peaceful garden and good outside air quality. The property value approach is designed to control certain variables so that any remaining price differential can then be assigned to the unpriced environmental 'good'. Similarly, a negative environmental attribute, such as poor air quality, can also be measured using the property value approach. A drop in property value would be expected with a drop in the surrounding area's air quality as a result of noxious contaminant discharges to the air from a new chemical factory. This method can be an effective way to put an economic value on the loss of a particular environmental amenity. The resulting amount can then be entered as a cost in the overall economic assessment of a project's environmental impacts.

Replacement Cost

The basic premise of the replacement cost approach is that the costs incurred in replacing productive environmental assets damaged by a

project or activity can be measured. Think of this approach as what society would have to spend to recover the same benefits that a particular resource provided free of charge. As an example, consider the flood protection functions of urban wetlands. Wetlands are very valuable for their ability to store floodwaters and slow the velocity of stormwater. If a large wetland were to be drained and cleared for development, flood control measures would have to be constructed in order to protect residential areas from flood damage. When wetlands are removed and the land developed, local governments will have to absorb the cost of constructing adequate flood storage and protection measures. The wetland's natural flood storage and attenuation capacities would have to be duplicated as closely as possible, perhaps even increased, for the newly developed site. If they choose not to upgrade flood protection, the community could stand to lose far more from damages to lost or destroyed property. It is this value for flood storage and protection measures that could be used as the economic value of the wetland when considering a project's environmental costs.