Chapter 8. Asset Value Considerations

If privately owned they (natural assets) may be depreciated, but in a large number of cases the loss of natural assets shows up as income. . . . However, such growth can be illusory if it is not recognized that the apparent increase in income is obtained at the cost of a permanent reduction in wealth.
—Salah El Serafy and Ernst Lutz (1989)

Current accounting systems and practices in the United States make little attempt to assess and track asset value, including the value of people’s health, intelligence, and initiative; of the contributions of nature’s services through healthy ecosystems; of the vitality of communities; and of renewable and nonrenewable resources. Much better accounting of the value of these and more traditional asset groups is needed to develop more sustainable management practices.

Assets that have been ignored by many economists are a crucial part of the value equation. Considering only money, possessions, and properties as assets while ignoring natural and social capital and nature’s services provides an incomplete and dangerous view of the world. More complete asset value considerations encourage a more complex, time-linked view from the past toward the future.

The calculation of asset value can provide clear and effective indication of sustainability. If the value of an asset group is declining, then its use is probably not sustainable. The decline in overall social and natural asset value can be charged against gross domestic product to find out how well a country is doing. This is rarely attempted. When asset valuation has been done, it has shown that countries that appear to be doing well are actually squandering their bank accounts, just like the spendthrift who quickly burns through his or her inheritance. Malaysia, for example, now has to import wood to keep their sawmills busy because their forests are almost gone.

Asset-oriented economics places a higher value on the future and encourages planning horizons of 20 to 100 years or more, instead of for just the next week or next quarter. This long-term view is critical to fully understand the value of a farm field, fishery, home, person, or vehicle. Asset-based value considerations can help in factoring in the true costs of the currently externalized costs of illness and death caused by pollution, community breakdown, environmental damage and cleanup, loss of ecosystem services and biodiversity, consumption of nonrenewable resources, and loss of potential land and water productivity. The fact that a decline may be slow can make it easy to miss. The decline, however, is still very important. While Europe is far ahead of the United States in assessing and tracking asset value, much remains to be done to better understand asset value through time around the world.

Careful accounting of total asset value can be done for a specific product, business, community, organization, family, person, sector of the economy, piece of land, watershed, water body, forest, farm, city, or nation. Charting asset value over time may show that although current operations appear profitable by today’s standards, asset value is actually declining and a land, resource, or community is being mined.

There is a popular bumper sticker in the mining communities of the West that reads “If it isn’t farmed, it’s mined.” Unfortunately, today most potentially sustainable resources are being mined. If a harvest exceeds its natural capital (rate of regrowth or recovery), then natural capital is being mined. Forestry, fisheries, water, and farming have not been sustainably managed in recent decades and are not likely to be managed better until asset value is more properly considered.

Asset value over time depends in large part on use and stewardship. Well cared for and properly maintained assets can maintain their value or even increase in value over time. sustained or increased. If abused or neglected, asset value can decline very quickly. A fishery or forest that is well managed will increase in value over time, while poor management can destroy the fishery or forest in a matter of months or years. A well-maintained piece of equipment may last almost indefinitely, as the tools in the historic Knight’s Foundry in California clearly demonstrate. Many of the tools and machines in this water-powered employee owned foundry were in use for almost 100 years.

Asset value considerations are more easily downplayed or ignored if the future is discounted. This has been one of the many follies of conventional economics, which has been “now” oriented. The high discount rates used in many economic studies suggest that the future, even the near future, has little value. With a discount rate of 10 percent, the future seven years from now is valued at half its value today. Low discount rates value the future more highly. However, even with a relatively low discount rate of 3 percent, the future 24 years from now is considered to be worth only half its value today. Much lower discount rates may be appropriate, perhaps even close to zero. Including all the costs and benefits in economic calculations is desirable, whether the discount rate is low or high. In general, low discount rates facilitate sustainable management, and high discount rates lead to mining, exploitation, and speculation in risky financial alternatives, such as collateralized debt swaps.

Individual discount rates are rarely explicit, but all individuals make plans that include some discounting.
Age, social or marital status, and life experience determine personal discount rates. A desperate subsistence farmer may have a very high discount rate, where even a month from now his or her asset value may not be worth much or where he or she may starve in two weeks. In contrast, a married, young forester working on lands owned and managed by his father and grandfather and with a newborn child may adopt a very low personal discount rate. This sustainable forester accepts a lower discount rate because his future appears secure and he expects to pass the forests on to his children.

Discount rates can also be related to opportunity cost, which can lead to speculation and risky, unsustainable behavior. This approach considers the discount rate to be equal to, or similar to, the highest rate of return possible on an investment. If all investments were sustainable, this would be fine; however, if speculative and unsustainable investments can return higher yields, then the discount rate is distorted. Just as bad money drives out good money, so does the pursuit of the highest return at any risk.

If discount rates are high, then very few sustainable investments will be made, and asset value will decline across the board as external environmental and social costs mount. The U.S. General Accounting Office often has used a discount rate similar to the average real interest rate on U.S. treasury bonds, which have averaged just 2.6 percent from 1956 to 1991. This is not unreasonable. Other agencies and departments have used discount rates as high as 10 percent or more. This might be appropriate for someone who is 80 years old, but it is folly for someone in his or her twenties and an entirely inappropriate discount rate for a government.

What should the discount rate be? It depends on what the desired future is. A good upper limit for a discount rate may be 2%, which in essence means that 36 years from now is worth half the present. I suggest that it should be even lower, perhaps 1 percent. A discount rate of 1 percent means that the value of the future is only half today’s value in 72 years, which is still well within a lifetime.

Discounting future environmental and social costs should be handled with care, because experience has shown that these costs often increase dramatically over time as the understanding of environmental systems and human health and behavior improves. Recall the example of the costs of slavery (see Chapter 4), or consider the costs of toxic waste cleanups, many of which involve once-legal disposal methods and sites. When environmental systems and their impacts are not well understood, a precautionary principle should be adopted. If a project might pollute the environment and cause significant damage in the future, advocates for the project will often develop cost–benefit analyses that consider future damage as less important by calculating the damage at present net value with a high discount rate. This approach suggests that the future costs will not be great. A careful investigation would instead bring all costs and benefits (including ecosystem services) into the calculation over a long period as current value and as future value and under a range of assumptions, perhaps with both low and moderate discount rates.

In assessing damage that may effectively be irreversible (e.g., mountain top removal by a large coal mine, flooding from a massive reservoir, deforestation on a laterite soil in the tropics), all of the benefits and costs should be calculated over a long period. Not just 20 years, but also 100, 200, or more years. As the goal becomes more sustainable management, then the discount rate should be reduced even further. If the United States expects to exist and prosper as a nation 200 years from now, it might consider a discount rate of only 0.5 percent.

Many classical economists do not like considering asset value at all. They argue that future costs and lost resources can be ignored because new solutions and new technologies can always be found. This could be called the curse of the “flat-Earth” economists, such as the late Julian Simon.

Intertemporal or intergenerational equity considerations also favor a very low discount rate. If a future generation could be present at the table (represented by an articulate accountant), they would advocate for a zero discount rate, or even a negative one. They would be saying in effect that the future is more important to them than today. Most economists cannot conceive of such a notion. A lawsuit by young children in the Philippines resulted in a case that went to their Supreme Court, where the children were held to have standing because of the importance of the future to them.

Individual investors all develop their own discount rates (whether explicitly calculated and acknowledged or not). Governments, institutions, corporations, and others determine discount rates for various activities that reflect political considerations, social calculations, and predictions of the future. Few, however, have included the asset value considerations that are essential for sustainable management.

The fable of the grasshopper and the ant offers an example of the two discount rate extremes. The grasshopper lives for today (high discount rate), and the ants work together for the future (low discount rate). A political discount rate of 36 percent that considers the future two years from now (reelection time for representatives) at half the value of today effectively discourages long-term considerations and future value calculations. The rate is a realistic consideration for a politician, driven in part by the short life of political careers and political patronage. With a discount rate of 36 percent, any effort to protect or restore natural or social systems to increase asset value and sustainable yield is unjustified. Even with a 10 percent discount rate there are few opportunities for sustainable management.

Foresters face long-term management problems more often than anyone else, with rotations of trees in some
forest types still planned for more than 150 years. This assumes a discount rate of only 0.5 percent. To plant, manage, and protect a forest for more than a century, the future must be considered important. The value calculation for reforestation can be improved by considering not just the wood, but also all the other benefits a healthy and complex forest ecosystem may provide, including annual harvests of mushrooms, truffles, and berries; recreational opportunities (hunting, fishing, swimming, hiking, camping); and many ecosystem services (water purification, oxygen generation). The value of these currently uncounted services will often exceed the value of the wood.

Reforestation can be very beneficial for areas that have been denuded, such as China, Haiti, Malaysia, and Ireland, where at one point 99 percent of forests were gone (now back to 6 percent). Reforestation will not take place with a high discount rate. A careful review of the situation in Ireland concluded that the critical discount rate was about 3 percent. Any higher than that and it did not pay to plant trees, even though the value of wood continues to increase and the forests provide many ecosystem services.

Discount rates influence behavior and management, which ultimately determines the rise and fall of asset value. The following sections will explore the asset value approach through five examples: a product, a farm, a fishery, a home, and an organization. Although the environmental costs are easier to calculate, it is likely that the social costs and benefits are even more important in most cases.

**Asset Considerations for Products**

More work has been devoted to product value and life-cycle costs and benefits than for any other asset consideration, but there is still much to be done. Migros-Genossenschafts-Bund, a Swiss co-op, has a computerized eco-balance program to evaluate products. Eco-IT and other software programs also examine the life-cycle costs and benefits of products and may be helpful in asset value determinations. Material intensity data (explored in chapter 5) can be used to determine product-manufacturing impacts and costs. The critical factor, however, in MIPS determinations is often service life, which depends on intent, action, and investment in maintenance and repair. These factors all can influence determine asset value and depreciation.

Consider the asset value over time of a light truck used by a small commercial operation (Table 8.1). The lifetime of a small truck from a manufacturer with high quality standards (such as Toyota) can be very long with timely maintenance and repair. The asset value over the lifetime of the truck is clearest when compared against a similar truck from a competitor with a less stellar historic quality ranking (Chevy). The vehicle from the lower-ranked competitor would probably have been replaced after 8 years. Current quality comparisons between the two manufacturers are much closer—a testament to the value of competitive markets.

The difference in cost of more than $6,000 per year could easily determine the survival or failure of a small business. The more reliable Toyota (based on historical data) also reduces costs related to breakdowns and repairs. Time away from productive work to deal with breakdowns and repairs can result in the loss of disappointed clients and can cause frustration for the employee, which carries its own cost. If time were charged for travel to and from the repair shop, the repair costs would increase significantly. The ultimate savings might be closer to $10,000 per year.

<table>
<thead>
<tr>
<th></th>
<th>Toyota</th>
<th>Toyota</th>
<th>Chevy</th>
<th>Chevy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase price</td>
<td>$12,000</td>
<td>$14,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td></td>
<td>$16,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>1,500</td>
<td>3,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repairs</td>
<td>1,500</td>
<td>3,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas, gallons</td>
<td>10,000</td>
<td>25,000</td>
<td>12,500</td>
<td>31,250</td>
</tr>
<tr>
<td>Ext. cost manuf.</td>
<td>3,200</td>
<td>6,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ext. cost oper.</td>
<td>5,140</td>
<td>11,250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inc. finance/oppt. cost</td>
<td>$102,000</td>
<td>$197,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Estimates for manufacturing and use include carbon dioxide and NO₂ only. Making a car also creates 1.5 tons of solid waste and uses 34,000 gallons of water. Facilities and supply chain external costs may be double or triple stated cost.

Including the external costs of maintenance and repair as well as costs related to supply chain leakages and disposal completes the asset value comparison. If a high-quality vehicle is purchased used, the buyer gets an even better deal because the steepest depreciation has already occurred. If maintenance is ignored, the vehicle’s lifetime may drop significantly, increasing the MIPS cost.
Asset Considerations in Farming

Crops, products, resources, and regional economies have always waxed and waned in response to national and international events and markets, environmental collapses, and government interventions. The only consistent theme has been a decline in ecosystem health and asset value. Land prices have often risen, but this has reflected a scarcity of land, not the health or productivity of the land. The primary failure of farm economics has been the lack of adequate consideration of asset value in relation to the environmental and social costs of poor farming practices. Although the environmental factors related to farming are critical for asset evaluation, the social costs and benefits may be equally important. Does the farm provide enough income to support a family and in turn, a healthy community?

Farming has often been glorified as the stable foundation of American society. The yeoman farmer is presented as a noble, caring steward of the land whose virtuous behavior made and transformed this country. Like most myths, this perception of farming contains an element of truth. A review of agricultural history and economics, however, reveals the darker side of farming in America. Farming has not been, in most areas, either stable or sustainable, and it will not be until more careful accounting is done. There are a very wide range of farm operations in the United States today, but most farm families rely on government subsidies or off-farm income to help stabilize their personal finances.

While it is possible to consider these issues across the range of agricultural enterprises, it may be more useful to consider more specific examples. Consider the asset value over time of two identical farms with the same land base but different operating systems. One farm is more “profitable” in today’s economy, while the other is a “marginal” performer by today’s standards.

Bernie’s farm specializes in a high-input, high-yield cropping system and shows a good paper profit. Equipment costs are high to ensure that the large monoculture fields can be harvested quickly. Yields are higher per acre for an average year, but considerably lower in a droughty or wet year. Erosion is high. Nutrients and pesticides run off into nearby streams and seep into the groundwater. High risks are taken and subsidies and crop insurance are essential to keep Bernie’s farm going. Bernie is often held up as a model farmer in the news because he has flashy new equipment and apparent high profits.

Henry’s farm is a mixed operation that produces a range of organic crops, chickens, and eggs. Henry maximizes the use of local inputs, minimizing environmental costs. Soil fertility is maintained through biological nitrogen fixation and use of manure. Crop rotations, chickens, and biocontrols are used for pest control. He maintains and repairs his old equipment. Labor requirements are higher for Henry’s farm, but capital costs are lower. Even in a droughty or wet year, the yields are good.

Figure 8.1 is a simplified profit and asset value diagram comparing the two farms. Profit is averaged rather than shown in a year-to-year variation, which would be much larger for Bubba’s “modern” farm. The trends are exaggerated to emphasize long-term changes. The profits and asset value for the two farms would be quite different if the full costs of soil erosion, ecosystem damage, and health impacts were subtracted and the improved health of people and the environment were added. True cost accounting would favor the sustainable farm and put the unsustainable farm out of business—the reverse of what happens today.

The Modern Farm
High input, high risk

The Sustainable Farm
Low input, low risk

Figure 8.1. Farm Comparison

It is as simple as it looks. The roots of the ongoing farm crises in the United States are based in the failure to consider asset value and true costs, particularly off-site liabilities and costs. In California, where regulations have begun to encourage more realistic (although still incomplete) cost accounting, wine grape growers have rapidly converted to more organic farming practices. Sixty growers, including many of the giants, have switched to organic practices in the last ten years, largely to avoid potential liabilities for environmental contamination. They also have found a marketing advantage for sustainable products.

The Amish have succeeded by practicing asset value–based farming, even though they are using farming methods from the 1800s. A detailed study of the persistence of farm families found that conservative, sustainable farmers in Iowa persisted in farming while boomers, farming for quick profits, did not. More sophisticated, modern, and sustainable farming practices, growing recognition of the value of crops that taste good...
and are healthier, and improved marketing can increase profits for a sustainable farm. True cost accounting can repopulate the countryside and make local food the first choice. The Slow Food movement (which strives to preserve the cultural cuisine and the associated food plants and seeds, domestic animals, and farming within an ecoregion), and Locavore movement (which encourages consumers to buy from farmers’ markets, direct from farmers, or even to grow or pick their own food) are helping to drive this transition.

If accounting rules were changed to more properly consider asset value, the farm economy would favor more sustainable practices, which would require more farmers per acre and enable more people to enter and survive as farmers. It would also encourage farmers to return to complex mixed-farming systems, rather than the extensive high-risk monocultures of today, with tens of thousands of acres growing the same cultivar and vulnerable to the same pests. Costs to American taxpayers would also reduce dramatically. Direct subsidies, most going to very large farms using environmentally damaging and unhealthful practices, commonly exceed $20 billion each year. Indirect subsidies and costs add many more billions of dollars each year. And as is discussed in Chapter 4, if environmental and social costs are included, the annual net loss for American farming may be $100 billion or more.

Existing direct farm subsidies are 300 times larger than the current investment in agricultural research and more than 3000 times the public investment in critically needed research on sustainable farm management now underway. Virtually no investment has been made in understanding farm economics from a true cost perspective. This is unconscionable, and changes must be made that will add asset value, human, and environmental considerations to farm accounting. Small towns across rural America are dying as a result of incomplete and distorted accounting. The land base that has supported them is also declining, as farmers succumb to continuing pressure to grow bigger, to grow fewer crops, and to increase inputs. These pressures would be removed if subsidies and other perverse government incentives were eliminated.

Improved accounting would help stabilize and restore rural communities such as Swansea, South Carolina, which was once a thriving crossroads town and railroad hub in a rich farming region (Figure 8.2). The downtown died as a result of changes in agricultural production, the addition of a bypass, competition from a suburban Wal-Mart (no subsidies for the historic local markets), the end of passenger rail, and the decline of local freight service. All of these changes were influenced by false price signals and government incentives.

**Figure 8.2. Swansea, a small rural town in need of revitalization, true cost accounting will help**

What about the price of food? It will go up as a result of true cost accounting, but not as much as one might expect. Farmers currently receive an average of only 10–20 percent of retail food cost. Therefore, increasing the prices paid to farmers 25% would often result in only a 2.5-5 percent increase in many food prices. Emphasis on local supplies would increase direct farmer to consumer sales on farm and in farmer’s markets and consumer supported agriculture agreements (CSAs). Farm direct purchasing by markets would also help reduce consumers costs and increase farmers profits. Savings in energy and chemical inputs would also help offset cost increases. Transportation savings would be significant, both in energy use and environmental and social costs. These changes could also lead to dramatic cuts in federal spending on agricultural subsidies with a goal of eliminating them completely. They would also reduce the risk of potential future toxic cleanups.

An analysis of a complete transformation to organic agriculture found that it would reduce farm-operating costs, increase product prices, and double farm income. The study assumptions were very conservative and greatly underestimated the productivity of organic agriculture. A more balanced, asset-based approach, which would include retaining the use of agrichemicals where and when appropriate, would lead to a more sustainable and profitable farming system with double current profits and an overall net gain in asset value rather than continuing losses.

**Asset Considerations in the Grand Bank Fishery**

The Grand Bank off of Nova Scotia was first exploited by European fishermen as early as the 1400s and was very actively used by the 1500s. Cod were caught sustainably for 700 years with technology that remained virtually unchanged. Gorton’s last schooner operated until 1950 using methods that a fisherman from...
1800s would have recognized. Beginning in 1950, however, the technology changed dramatically. Larger ships with bottom trawls that cause tremendous damage to the ocean floor replaced simpler and safer technology. In one hour these large ships could catch the same tonnage a traditional ship would catch in the whole season. As demand and prices remained high, the pressure on the fishery increased from international fleets. Fishing intensity and profits increased very dramatically and the cod harvest peaked in 1968 at 810,000 tons, roughly four times the typical historic catch. In the 1970s, the harvest dropped back into the 200,000-ton range, where it stayed until 1978, when it dropped to 70,000 tons.

Down and down it went, and by 1988 the fishery managers were so worried that they argued the quota should be cut in half. Fearing public outcry, the take was cut only 10 percent by the local politicians. By 1991, the population of cod had dropped to less than 1 percent of its original size. Government fisheries scientists using inappropriate statistical methods, local politicians, and the fishermen themselves had inadvertently destroyed the cod fishery. They also failed because they had only considered the cod, not the ecosystem that supported the cod and the fishermen. The destruction of the ocean floor ecosystem by trawlers probably played an important role.

Gone were the smaller fish, the types of food the smaller fish ate, and the complex benthic community that provided safe havens for small fish to hide and grow. The managers and fishermen neglected ecosystem structure and function, and instead focused on a top-level predator—the cod. Incomplete accounting failed to protect the cod and the ecosystem it needed to survive.

In 1992, the cod fishery was closed indefinitely, putting 35,000 people out of work. This has led to very costly government support for the out-of-work fishermen and their families, about $500 million to start with and several billion more since then. The loss of careers, often after multiple generations, has led to problems depression, anger, and violence, which have been somewhat mitigated by generous welfare payments. The cod population has not yet recovered, and neither has the ocean floor, which is now raked by crab and shrimp boats.

The mismanagement and collapse of the cod fishery in the Grand Bank has had enormous financial, social, and environmental costs. The asset value of the intact fishery can be estimated by looking at the harvest levels when they were stable. In 2008, cod was selling for about $4 per pound. A 200,000-ton year, therefore, would be worth about $1.6 billion. The size of fisheries stock is notoriously hard to estimate given our ignorance, but the size of the intact fishery probably was 10 to 20 times the sustainable harvest, or in the range of $20 billion to $40 billion worth of cod. This value, however, neglects other ecosystem services that the Grand Bank and the cod provided before they were raked out by the trawlers. A more realistic estimate of asset value might be $50 billion.

If we plot the asset value and harvest over time, it might look like what is shown in Figure 8.3.

![Figure 8.3. The Grand Banks Cod](image)

Details about the historic cod fishery are largely unknown, and both harvest and standing-stock information are limited until 1988, when the fishery was already in decline. A careful study of fishing intensity and catch on the Scotian Shelf found that even hand-lining in the 1800s was decreasing the stocks. Cod stocks on the Scotian Shelf were an estimated 1.26 million tons in 1852, but had collapsed 96% to about 50,000 tons by 2008.

Recovery of cod stocks in the Grand Bank is unlikely because the bottom trawlers have destroyed the habitat very thoroughly. After the ocean bottom is trawled, it looks as though the floor has been bulldozed. It did not have to end this way. If the fishermen and local politicians had acted sooner, the cod could have been saved. If the accounts had been tabulated completely, it would not have happened. The Norwegians stepped in just before it would have been too late to save their cod fishery, and it has recovered relatively well.

Sadly, if the asset values of all global fisheries were plotted, they would look much like that of the cod fishery in the Grand Bank. Almost all of the world’s major fisheries are in crisis. Fishing pressure and fishery fleet
registration is growing fastest in the poorest countries with laxest laws and little or no enforcement. Many fishing boats from developed nations are being reregistered in these lowest-price-at-any-cost havens, with a nominal local captain.

**Asset Considerations for a Building**

Asset value of a commercial building or house can be considered in much the same way. Denver, Colorado, has a pleasant climate, with a cold winter (5,673 heating degree days) and a mild summer (625 cooling degree days). A 2,000-square-foot home could be stick built (wood frame) or built with locally grown straw bales. It could be solar- and climate-resource adapted, or, as is often the case today, not adapted at all.

Good design will improve thermal performance, comfort, and security. By using proper orientation, shape, insulation, thermal mass, ventilation, and shade, energy use and environmental impacts can be dramatically reduced. There are significant differences in asset value between a nonsolar-adapted stick-built home and a solar-adapted home built with straw bales (Table 8.2). These changes also affect health and productivity of the occupants, so this estimate of value understates the case.

**Table 8.2 Performance, Energy and Life Cycle Cost Considerations for two buildings**

<table>
<thead>
<tr>
<th>Performance</th>
<th>Non-solar</th>
<th>Solar</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denver, CO</td>
<td>Stick built</td>
<td>Straw bale</td>
<td>Over base</td>
</tr>
<tr>
<td>Cooling BTU, sf, yr</td>
<td>7450</td>
<td>1816</td>
<td>75.6%</td>
</tr>
<tr>
<td>Heating BTU, sf, yr</td>
<td>41075</td>
<td>3016</td>
<td>92.7%</td>
</tr>
<tr>
<td>Total BTU, sf, yr</td>
<td>48525</td>
<td>4832</td>
<td>90%</td>
</tr>
<tr>
<td>At 13¢ kwh, yr</td>
<td>$3700</td>
<td>$370</td>
<td>90%</td>
</tr>
<tr>
<td><strong>Energy $ 30 years</strong></td>
<td>$111,000</td>
<td>$11,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>CO₂ 30 years tons</td>
<td>600</td>
<td>60</td>
<td>90%</td>
</tr>
<tr>
<td>CO₂ ext cost</td>
<td>$12,000-20,000</td>
<td>$1,200-2,000</td>
<td>$10,800</td>
</tr>
<tr>
<td>SO₂ 30 years tons</td>
<td>2.6</td>
<td>0.26</td>
<td>90</td>
</tr>
<tr>
<td>SO₂ ext cost</td>
<td>$37,000-60,000</td>
<td>$3,700-6,000</td>
<td>$33,300</td>
</tr>
<tr>
<td>NOₓ 30 years tons</td>
<td>1.3</td>
<td>0.13</td>
<td>90</td>
</tr>
<tr>
<td>NOₓ external cost</td>
<td>$30,000-40,000</td>
<td>$3,000-4000</td>
<td>$27,000</td>
</tr>
<tr>
<td><strong>Total external cost</strong></td>
<td>$78,000-120,000</td>
<td>$7,800-12,000</td>
<td>$71,100</td>
</tr>
<tr>
<td><strong>Energy+external cost</strong></td>
<td>$189,000-231,000</td>
<td>$18,900-23,000</td>
<td>$170,000-208,000</td>
</tr>
</tbody>
</table>

Price differences reflect two different external cost estimates, both may be low. Opportunity cost of energy payments not included. Base case modeling by J. Rennick, SLOSG

The external costs over 30 years exceed the energy costs. The health costs of power production using fossil fuels include asthma, pulmonary disease, and other health problems in the vicinity and downwind of a power plant as well as significant and far-reaching effects on ecosystems over hundreds of square miles. The difference between the two homes increases even further when the embodied energy and environmental costs of materials are compared.

The energy and environmental costs of building a power plant should also be included as well as the costs of heater and air-conditioner construction and repair and maintenance of power lines. The costs can be significant, as utility-line corridors have very high ecological impacts. Estimates for the external costs of pollution are conservative, because the analyses of ecosystem impacts are very weak and tend to underestimate costs.

Very few homes are used for only 30 years. In fact, most homes, even those that are not well built, are often used for 100 years or more. The lifetime of the two homes would be comparable if the build quality were similar. At the end of life, the walls of the straw-bale home can be composted. The wall materials from the stick-built home are unlikely to be recycled and will probably go to a landfill, which adds additional value to the straw-bale home.

The two homes would offer comparable comfort when the power is on, although most people prefer the quiet and stable temperatures in a super-insulated straw-bale home. When the power goes out after an ice storm or blizzard, the equation changes. People living in the conventional stick-built home may be uncomfortable, while the straw-bale home sails through several days of no power without a problem. This security value should be added to the asset valuation of the straw-bale home.

Building value also depends on detailing and construction quality. Efforts to provide the lowest first cost home or building led to very high costs over time. For example, eliminating roof overhangs is a common choice in reducing first cost, yet it saves remarkably little
money and leads to long-term problems such as water leaks into walls, siding failure, and mold, which can adversely affect the health of occupants (Figure 8.4). Is saving a few hundred dollars at the cost of potentially thousands a good choice? Only with the current system of accounting. If asset-value accounting were used, building quality would improve and design would include life-cycle considerations and maintenance and utility costs, which are currently ignored.

Figure 8.4. Details matter, the lowest price at any cost becomes very costly in the long term

Quality materials and craftsmanship also add long-term value. A well-built home or building will require less maintenance and experience far fewer repairs. A more expensive sink may seem like an unnecessary expense, but if it drains properly instead of pooling water, it may last twice as long. All too often the cheapest option is selected, because the developer/builder has no stake in the future. And the home buyer who replaces the failed sink typically assumes the lower cost replacement is fine, because, “We won’t be living here that long.” But this leads to very high long term costs. As a conscientious builder once told me when asked about the possible options for fixing a rundown home, “Do what’s good for the building.”

Good design can add further value by reducing input costs and external costs. Rainwater harvesting can supply salt-free water for irrigating a garden, reduce stormwater runoff costs, and help provide fresh food. Grey water from sinks and showers can be used for irrigation, reducing the cost of maintaining landscaping used to provide summer shade and protection from winter winds.

Dramatic savings and improved sustainability can be achieved in homes and buildings at any scale. The ING Bank building in Amsterdam achieved impressive savings for a very large building, cutting energy use almost 90%. This type of smart building is more common in Europe, where buildings are typically designed, built and occupied by the companies that own them. In the U.S. it is more common for a developer to design and build a facility that will be owned by someone else and then leased by a third party. Energy and maintenance costs are not an issue for the developer.

In the U.S. good buildings are more commonly found in institutional projects. The synagogue for Congregation Beth David in San Luis Obispo is a good example. This innovative building designed by the San Luis Obispo Sustainability Group cut energy use 86% percent below California’s Title-24 energy conservation codes with a solar- and climate-adapted building that includes some straw bale walls. Straw-bale buildings in China and Mongolia have typically cut energy use for heating by 50 percent. When solar- and climate-adapted designs are correctly integrated into new or retrofitted homes or buildings, energy savings of 70–90 percent or higher over conventional construction should be expected. For retrofits, savings of 50–70 percent should be expected, as the Ridgehaven retrofit for the city of San Diego showed.

Asset Value Consideration for an Organization

A nation’s wealth is its people, and some of the best people choose to work for nonprofit or nongovernmental organizations (NGO). These organizations have increasingly had to step in to fulfill needs that were once met by governments. As environmentalist Paul Hawken has observed, they have become the immune system of the economic system. Many organizations that I have worked with over the years illustrate the value of social capital and services. Nonprofits and NGOs employ great people who are committed to doing important work with tremendous satisfaction, but often at a considerable economic cost to themselves and to their families.

Conventional economists fail to understand this desire to do the right thing and the lack of emphasis on monetary and material enrichment. My champions and heroes hail back to the past, when cooperation and service mattered more than being rich in goods.

Consider the example of the nonprofit Development Center for Appropriate Technology, which is based in Tucson, Arizona. Founded by David Eisenberg in 1991, DCAT has played a pivotal role in encouraging building code officials and developers to consider sustainability in design. Key initiatives and contributions include: the working paper “Straw Bale Construction and the Building Codes”; the survey “Assessing the Barriers to More Sustainable Construction,” which identifies specific areas in building regulations that pose challenges to best
sustainable practices; several special issues in Building Standards Magazine (the official publication of the International Conference of Building Officials) on alternative materials; a column on sustainability for building code officials; vital input and research on improving building code amendments and additions; partnerships with key groups in building and code enforcement; checklists and assistance for contractors and homeowners to speed approval of alternative building materials and systems; testimony to Congress, and hundreds of workshops, presentations, and papers. David Eisenberg, Tony Novelli, and a small group of dedicated and determined volunteers have equaled or exceeded the impact of massive bureaucracies with hundreds of employees and millions (and in some cases billions) of dollars (Figure 8.5). The work of DCAT has all been done on a shoestring.

Figure 8.5. Human capital, America’s strength, DCAT’s David Eisenberg and Tony Novelli

The asset value of the building stock in America and around the world has been improved through their work. Many sustainably designed homes could not have been built without the pioneering work of the individuals at DCAT. Alternative building materials that are sustainable would be much harder to use if DCAT had not developed critical background information and reports. The value added by their efforts in research and engineering to enable building code revisions, education of code officials, and individuals to manage the code/building interaction process is significant. The long-term asset value added by this small group is probably in the hundreds of millions of dollars, with a return on investment of 100 to 1 or more—a return that cannot be realized in any other market.

Asset Value Considerations

The examples of asset value discussed above cover a range of considerations, and although each case is different, each involves the role of environmental and social capital in asset value. Traditional evaluation by most economists would not address any of these asset considerations properly. Asset valuation issues are rarely discussed even in ecological economics texts, let alone in traditional economics. The focus is almost always on cash flow, interest, finances, and revenue, not on the often more important issues of asset value and sustainability. A special focus for future asset value research should be on the often-perverse effects of government actions and policies. They are important across the full range of human activities and business operations.

Government interferences disrupt asset value considerations in many ways. One of the worst interferences is the provision of subsidies for mining potentially renewable resources. Fisheries subsidies began in the 1700s in England and the 1800s in France. As Adam Smith noted in 1776, subsidies often go awry, “The bounty [subsidy] to the white-herring fishery is a tonnage bounty, and is proportioned to the burden [capacity] of the ship, not to her diligence or success in the fishery; and it has, I am afraid, been too common for vessels to fit out for the sole purpose of catching not the fish, but the bounty.” Today, the worldwide subsidy for fishing is estimated at $1.50 paid for every $1.00 of fish harvested from the world’s oceans. By helping build bigger, faster, and more destructive fishery gear, subsidies have driven fisheries in many parts of the world to extinction at very high environmental and social costs. Yet rarely are politicians held accountable. They respond to pressure from fishermen with little concern for future costs and resource declines.

Agricultural subsidies began in the earliest days of the United States and helped drive the development of slavery, a farm practice with incalculably large social costs that continue to burden the American economy. Farm subsidies today involve tens of billions of dollars that prop up many farms, farm communities, and politicians and that inflate land values. In some communities, up to 90 percent of farmers rely on subsidies to survive. They generally will acknowledge that they are farming the subsidies as much as the soil. And because they have usually planted a specific subsidized crop in the past farmers may be required to continue to grow a crop even when there is clearly no market for it. Subsidies for crop insurance encourage risky and environmentally costly gambles on crops that are damaging to the environment. Profits in good years are privatized, while losses are made a public cost. And dumping subsidized crops in developing countries can wipe out local farmers, forcing them to move to growing cocaine, opium, or marijuana to survive or to emigrate to the United States, legally or illegally.

Adam Smith would have recognized the many problems that developed in the solar and wind industries in response to subsidies in the 1970s. Wind was, and is, one of the most attractive sources of renewable energy. Subsidies were enacted for wind and solar power to offset
the existing enormous subsidies, both direct and indirect, for fossil fuel and nuclear power plants. Subsidies initially increased the cost of both solar and wind equipment by driving up demand for equipment. They also encouraged subsidizing farming. My favorite example was a wind project near Palm Springs, California. It was built using Vietnam-era helicopter blades, which were, to say the least, ill-suited for this use. As the blades broke, they were replaced with plywood blades to make it look as though they were whole. And when fraud investigations began, actors were hired to climb up ladders to pretend they were fixing the blades.

Asset value considerations are also important in questions about public policy in very different arenas. Researchers have begun to explore asset value considerations in examining the problems of poverty. Expenditures are not a very good predictor of long-term poverty. Asset value can be a better predictor by reflecting a family’s resource reserves and its potential to hang on until a new opportunity arises.

**Asset Value Considerations Matter**

The calculation of asset value provides clear and effective feedback on sustainability. It can also reveal the rapidly increasing external cost of current lifeways. The spread of the mountain pine beetle in British Columbia is attributed largely to warmer winter temperatures that are no longer cold enough to kill beetle larvae (Figure 8.6). The rapid dieoff of more than 15 million acres of pine forest is both an ecological and economic disaster. The asset value of the forest has collapsed like a burned building. More than 1 billion cubic meters of high value pine will be lost by the time the damage is complete. This will cost the government of British Columbia about $6 billion in stumpage fees as well as lost tax revenues from timber industry workers and operations. The value of the lost wood in the retail market totals about $73 billion, and the cost to the forest industry will total about $32 billion. These economic impacts are affecting the future of timber industry workers, and will lead to a train of additional government costs, which may well be dwarfed by the loss of nature’s services and natural capital. To whom should British Columbia send the bill? Exxon-Mobil, General Motors, the electricity utilities, or the commuters on I-15 in San Diego? The American taxpayers? Or to Russia and China?

**Figure 8.6. Mountain pine beetle, British Columbia**

Better accounting of the value of financial, social, and ecological assets is needed to develop sustainable management practices. Considering only money, material goods, and property as assets, while ignoring natural and social capital and services, supports unsustainable management and leads to very high and perhaps irreparable damage to ecosystems and communities. Asset value considerations foster a more complex, time-linked view of the future and will protect and enrich the lives of current and future generations.