SPECIAL REPORT

TD Economics

November 20, 2014

VALUING THE WORLD AROUND US: AN INTRODUCTION TO NATURAL CAPITAL

Highlights

- Natural capital refers to the financial value provided by natural resources and ecosystems. It can be measured in terms of economic value, environmental and social benefit.
- Natural capital provides enormous measurable benefits each year.
- Including natural capital valuation in decisions can help individuals, firms, and governments to better understand the true costs, benefits and return on investment of planned activities. Failure to consider natural capital impacts can lead to sub-optimal outcomes, and unrecognized costs.
- Many methods exist for the economic valuation of natural capital. Unfortunately, a unified standard for their application does not exist at present.
- Two case studies are provided in this report to illustrate the benefits of natural capital, including the valuable annual services. The examples show that by including natural capital in the decision making process, firms, individuals, and governments can achieve better outcomes with greater benefits for society at large.

Environmental benefits and costs are not always properly incorporated into economic and policy decisions. This failure can lead to unexpected costs or unanticipated consequences. Accordingly, it is essential that more consideration is given to the value of natural capital. Regrettably, there is no standardized definition of natural capital. In this paper, TD Economics proposes its own definition that attempts to capture the direct and indirect benefits arising from the current and future stock of natural resources. Armed with a definition, this paper outlines the challenges in valuing natural capital, highlighting that one must capture the direct, indirect and intangible benefits. The good news is that, while not easy, natural capital can indeed be valued through various market and non-market pricing methods. By establishing a definition and valuation framework, it is possible for businesses, governments, and individuals to incorporate natural capital considerations into economic and social decisions. By doing so, better choices can be made that more fully reflect all of the costs and benefits, and more accurate estimates of the return on investments can be made. Natural capital can also provide options and alternatives that are not apparent when traditional thinking is used. Ultimately, this has fundamental economic and social benefits. Since the discussion of natural capital is not a conventional approach, two case studies are provided to illustrate the value of environmental considerations.

Defining Natural Capital

The term natural capital gives one a sense of the subject potential – just as one may talk about capital in the form of machinery and equipment, or human capital in the form of the raw potential of individuals, it is also possible to refer to natural capital (and the potential benefits thereof) derived from the environment.

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However, the subject is complex because the environment provides a plethora of different benefits. As a result, numerous definitions of natural capital exist, and not all of them agree with each other. For instance, the Natural Capital Coalition defines natural capital as:

"The finite stock of natural assets (air, water, land, habitats) from which goods and services flow to benefit society and the economy. It is made up of ecosystems (providing renewable resources and services), and non-renewable deposits of fossil fuels and minerals".

Robert Costanza, a prominent researcher in the field of ecological economics, defines it as "...the stock of natural ecosystems that yields a flow of valuable ecosystem goods or services into the future". Other researchers and organizations have proposed various ways of defining natural capital.

In our opinion, developing a consistent and holistic definition is foundational to any attempt to then quantify environmental considerations. The definition which we feel is most effective is:

"Natural capital is the stock of natural resources (finite or renewable) and ecosystems that provide direct or indirect benefits to the economy, our society, and the world around us."

The benefits take many forms and have many dimensions, and are referred to as natural capital services (also often called ecosystem services). For example,

- A deposit of gold can be mined and used to produce jewelry, industrial products and other outputs, although extraction is likely to have environmental impacts that must also be taken into consideration.
- A wetland provides a breeding ground for fish, opportunities for hunting and other recreation activities, and also filters the water that passes through it.
- An urban park can help clean the air, and reduce the risk of floods, while providing natural beauty and a place to relax.

Natural Capital Services: the output or benefits, both direct and indirect, that natural capital provides.

As Table 1 illustrates, natural capital provides us with a wide variety of valuable services, both direct and indirect.

Re-defining the Production Function

When thinking about how the economy works in an abstract sense, economists often refer to the "production function", a stylized formula that relates economic output to its inputs. The usual form (simplified somewhat) is

$$Y = f(L,K)$$

where Y is output, L is labor, K is capital, and f() is a function relating these terms.

In effect, the formula says how much can be produced for a given level of inputs. This traditional form of the function ignores the crucial role that natural capital (NC) has in the economy. A more complete function would be

$$Y = f(L, K, NC)$$

This expanded formulation emphasizes that natural capital is just as important to our economic activity (and thus our quality of life) as the labor working in our factories and offices and the equipment used in production.

Why Value Natural Capital?

There is an old quote that says "if you can't measure it, you can't manage it". As society becomes increasingly concerned with its environmental footprint, it is important to be able to account for exactly what that footprint is and what impact our activities are having on the environment. A challenge in the past is that many environmental services are what economists refer to as public goods: resources available to all, where one person's use does not stop another from using the same resource.[1]

Table 1: Natural capital services by land type

Land type	Service
Forests	Carbon storage and sequestration, soil formation, waste treatment, air quality, storm water control, recreation, fibre, wildlife habitat.
Grasslands	Carbon storage and sequestration, water regulation, erosion control, soil formation, waste treatment, pollination, food production, wildlife habitat.
Wetlands	Disturbance regulation, water supply and treatment, food production, habitat/refuge.
Lakes, rivers, riparian zones	Water supply, waste treatment, food production, erosion control, habitat.
Croplands	Food production, habitat/refuge, scenic
Other land types	Scenic, existence value

Source: Sauer (2002); Olewiler (2004); TD Economics.

Public Good: A good where one person's use does not exclude another from using it, and people may not be excluded from using it. For example, the air we breathe, or a streetlight.

Because of this unique property, the impact on these resources was often not taken into account in past decision-making, as impacts were often considered too diffuse to matter.

By incorporating natural capital into decision making, the externalities associated with those decisions can be included in the cost-benefit framework. An *externality* refers to the consequence of an activity that is experienced by unrelated third parties, such as the pollution from a factory. While air pollution (for example) may not affect the profitability of a factory, it affects all those who breathe the air. By incorporating natural capital into the decision making process, externalities become included as well, bringing social costs into the equation.

Externality: A consequence of an economic activity that is experienced by unrelated third parties. Externalities can be positive or negative. Examples include the pollution from a factory, or the shade of a boulevard tree

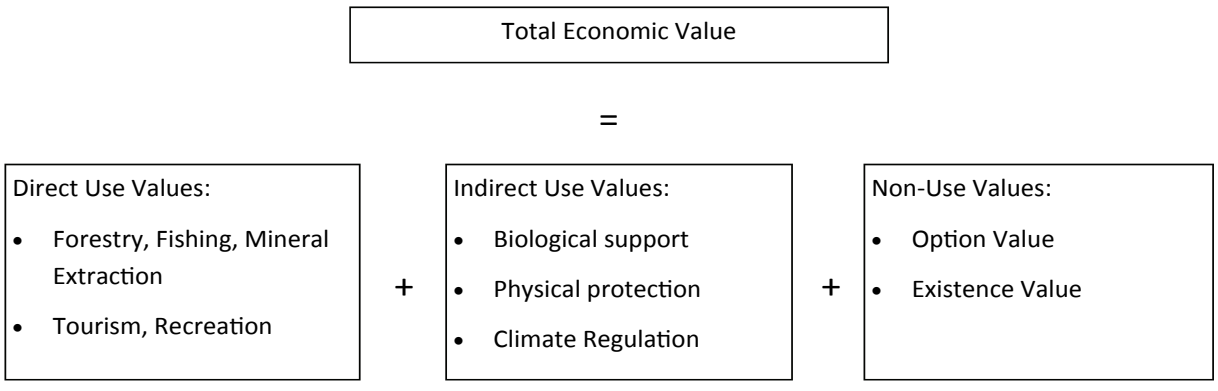
Beyond a more holistic accounting of costs and benefits, including natural capital in decision making may lead to alternative solutions that would not have been considered otherwise. New York City provides a concrete example of the value of including natural capital in decision-making. In 1997, the city saved the $4-6 billion it would have spent on a water filtration plant by instead paying $250 million to buy up land around a source watershed in the Catskill Mountains, ensuring that the land remains a viable natural filter for its water supply – a positive externality of preserving the land.[2] In another case, Dow Chemical constructed a wetland at a facility to remove pollutants from wastewater before it enters the sewage system. By using a wetland rather than a wastewater plant, savings of over $35 million were realized.Valuing natural capital is also important because it allows us to put a value on numerous services that were not previously valued, including the social activities that many already enjoy, such as fishing, hiking, cycling, and other outdoor activities.

It is important to keep in mind that valuing natural capital does not imply its commodification or privatization. Assigning a value to natural capital does not change its fundamental nature. The importance of valuing natural capital isn't the price itself; rather it is to enable informed decision-making that includes all potential impacts. Indeed, including natural capital in the decision making process may lead to more economic growth, both through industries that work to preserve and expand our natural capital, as well as through potential efficiency gains that solutions using natural capital may provide.

What Standards Exist for Valuing Natural Capital?

There is currently no unified standard for the valuation of all natural capital services. Existing frameworks, such as the United Nation's System of Environmental-Economic Accounting (SEEA), are generally focused on the commodity value of items that can be directly measured, such as the harvest value of timber or proven reserves of oil and gas. Many also track money spent on environmental protection, including carbon taxes.

Figure 1: The Total Economic Value Framework



Source: NOAA, TD Economics

At present, there is no unified, globally recognized system of accounting for the universe of renewable natural capital services, such as flood control, biodiversity, or scenic values. Progress is being made on this front, however, as a number of initiatives are currently underway worldwide to establish standards. The most prominent of these projects has been initiated by the Natural Capital Coalition (NCC), an international group of private industry and non-profit organizations. The NCC is currently overseeing a number of consortia in the ongoing creation of a Natural Capital Protocol to enable firms and other stakeholders to value natural capital in a scientific, consistent manner.

How Can Natural Capital Be Valued?

Although there is no universally accepted framework and methodology for natural capital valuation, there is a well-established body of economic literature from which a framework and valuation methodologies can be developed.

To value natural capital, a two-step process, based on economic literature, is appropriate. First, a framework of Total Economic Value (TEV - Figure 1) is used to classify the different values that a resource may provide. The goal of the TEV framework is to ensure that the vast majority of benefits and values are being captured. Second, a valuation methodology is chosen that suits the value being measured. Each of these methods and benefits will be covered below.

Direct use values are those which most closely match the values associated with traditional forms of capital. Just as a piece of equipment produces output, or a new apartment building provides rental income, a stand of trees can produce a yield of lumber, or a national park support recreation activities.

Indirect Use Value: Values gained that don't require consumption of a resource.

Indirect use values derive from the existence of the natural capital, but don't necessarily require consumption. The existence of forests, for example, purifies the air and supports a multitude of animal life. Physical protection can include flood and erosion protection. Indirect use values may also include inputs to direct use values, such as providing habitat for wildlife.

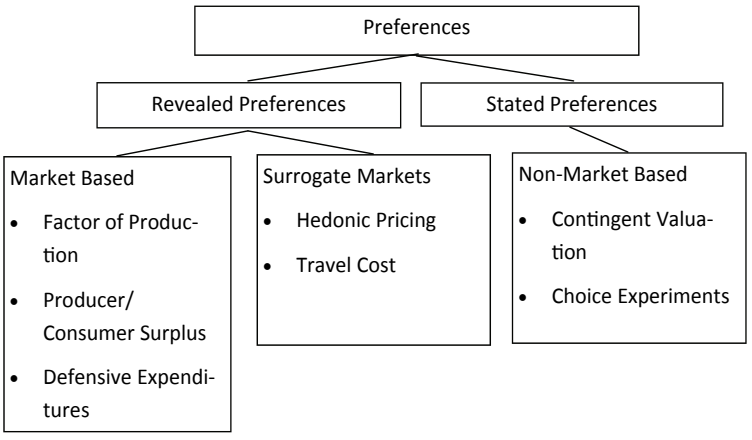
A concrete example of indirect use values is the draining of a wetland to make room for a development. Before development, the wetland helps to purify water, prevent soil erosion, and provides a habitat for numerous species. These benefits disappear once the wetland has been drained. It is also possible that the wetland was valued simply for existing – just as there is a value in national parks beyond the monetary value spent by visitors.

Non-use values include option value and existence value. Option value is the value that arises from having a choice to utilize a resource at some point in the future. Existence value is the value of knowing that something exists. A person may not be an active user of a forest, for example, but may still value having it there for future generations to use. A mineral deposit does not need to be mined immediately, but owning it provides the option of future mining, which has value in and of itself. Existence value also includes the value of traditional lands to first nations and other groups. It also captures non-measurable benefits – for instance, the value of watching a sunset in your favorite park.

Option Value: The value of being able to defer consumption to a later date.

The three categories of use value are not mutually exclusive – for instance, a wetland can support hunting and fishing (direct use value) while still providing water purification (indirect use value), and potentially existence value for those living nearby. By considering the Total Economic Value, all benefits of a resource can be valued, not just the simple commodity value.

Figure 2: Preferences Allow Values to be Assigned



Source: TD Economics

Once the values of interest have been identified, a valuation method can be chosen. There are many established methodologies (Figure 2 includes the most common), all of which, like standard economic valuation, rely on preferences.

Revealed preference valuation methods rely on observed spending choices to establish value.

Market based valuation methods are the most straightforward revealed preference method; for products such as timber, minerals, or gas, there is an observable market price. Market based measures can also be used to evaluate the impact of natural capital in the reduction of pollution: carbon has a price, and there is an emerging scientific consensus on the value of reducing other pollutants, such as sulphur dioxide. This data can be used to calculate the value of water purification in a wetland, for example. **Defensive expenditures** are a related concept – by observing the amount spent on constructed flood defensives, a value can be assigned to the flood defenses provided by trees, rain gardens, and other resources.

Defensive Expenditures: The money spent to protect against something undesirable. For example, water purification.

Surrogate market valuation methods rely on indirect expenditures. For example, the time and money spent to visit a national park tells us how much people value that park. Hedonic pricing methods, common in real estate valuation, can also be used to value natural capital. The higher price commanded by a home close to a green space relative to a comparable home without the same amenity tells us how much the homebuyer values that space.

Non-market-based valuation methods do not rely on observable prices, but rather use surveys to ask consumers directly how they value natural capital.

- **Contingent valuation** is a process where people are asked how much they would be willing to pay to preserve something.
- **Choice experiments** share many of the methods, but don't ask the question directly (for instance, a survey may ask "Would you rather your taxes went up $5 per year or the city bulldoze the local forest?". If properly constructed, a value for the resource can be inferred from these questions.

Contingent Valuation: A survey based method which directly asks individuals to value resources.

Once the value of natural capital services has been determined, the value of the natural capital stock can be assessed. In some cases, such as for mineral deposits, the supply is known and fixed, and assigning a value is straightforward. In the case of renewable resources, because there is a known and recurring flow, the value of future services can be estimated. Through the accounting practice of discounting future values, one can measure the current dollar value of these benefits.[3]

Can We Run Out of Natural Capital?

Natural capital can be either finite or renewable (regenerating with time). Even renewable resources may be depleted, however, if overharvested. Many of these resources have a *sustainable yield* – the harvest that can be consumed each year without depleting the resource. However due to the public good characteristics of many types of renewable natural capital, it may be difficult to enforce the sustainable yield. Exceeding this yield reduces both the capital stock, and the sustainable yield itself. Continually overharvesting may deplete the resource entirely, as was seen in the Atlantic cod fishery. Economists refer to a situation where overharvesting occurs due to the inability to enforce sustainable yields as "the tragedy of the commons".

What Challenges Exist with Natural Capital Valuation?

The valuation of natural capital requires a relatively large amount of data regarding the characteristics and services of a given area, and careful analysis. While most pollutants and other externalities have established values, other services, such as beautification or existence value may be more challenging to evaluate, and there is not yet a consensus on what these values should be. For these reasons, studies of the same resource may result in different values. This underscores the need for a global standard, which is regrettably lacking at the moment.

Sustainable Yield: The harvest that can be consumed year after year without depleting the natural capital stock.

What Role Can Business Play?

Businesses are typically the largest direct consumers of natural capital, and as such are key stakeholders. There are three primary ways in which business can support natural capital:

- **Growth**: Businesses can help increase natural capital through active programs such as tree planting, restoration of wetlands, or other programs.
- **Protection**: Firms should include natural capital considerations in their decision making processes. This can ensure the future supply of natural capital services (water, clean air, etc.) through the protection of natural spaces, such as: forest, parks, wetlands, etc.
- **Reduction of Loss**: Again, by including natural capital considerations in their actions, businesses can reduce their use of natural capital. Firms would thereby help reduce the strain on the system, helping humanity remain within the overall sustainable yield of natural capital. This could include reducing their carbon footprint, improving their water use efficiency, or similar programs.

What Role Can Individuals Play?

Individuals can exert great influence through their collective voice, their wallets and their actions. By incorporating natural capital into their decision making and priorities, individuals can help reduce loss and encourage growth and protection of natural capital. This can be accomplished by making conscious decisions that support natural capital, such as purchasing more fuel efficient vehicles (reducing the strain on and loss of natural capital), landscaping their homes using native plants (growing natural capital), volunteering to tree plant, or cleaning up local parks (protecting existing natural capital). Once consumers start incorporating natural capital in their actions, businesses and governments are sure to notice and cater to consumer demands.

What Role Can Government Play?

All levels of government have a role to play in bringing natural capital into the planning process. Government policy can help support natural capital across the three categories identified for businesses:

- **Growth**: Government can help increase natural capital in numerous ways, including afforestation and restoration programs on government owned land and tax or other incentives for firms or landowners to undertake similar efforts.
- **Protection**: Legislation to protect valuable natural capital resources can be a valuable tool. Beyond legislation however, incorporating natural capital into government planning and decision making processes can make a big difference, particularly at the municipal level. Protecting natural capital resources can help reduce infrastructure and other costs.
- **Reduction of Loss**: Similar to the growth category, government programs to encourage afforestation and restoration can help to reduce or offset losses elsewhere. Including natural capital impacts in the land use and development process can also help to reduce loss and result in better planning outcomes.

To make the concept of natural capital more clear, a couple of case studies can demonstrate how to value environmental considerations and how incorporating natural capital into decision making can hold material benefits.

Case Study 1: Urban Forests in New York City

New York, the largest city in the United States by population, is known around the world as a city of concrete and skyscrapers. While most people are likely familiar with Central Park through movies and television, it may surprise some readers to learn that New York also has an extensive urban forest of nearly six million trees spread throughout the city. These trees represent a capital investment for the city just as much as the subway system or sidewalks, but often hadn't been taken into account in planning decisions. This is beginning to change, as the city of New York has commissioned a study of its urban forests, and has undertaken several projects to maintain and improve this resource (previous TD work has looked at New York's efforts to quantify and improve its use of natural capital. See The Greening of New York City: Lessons from the Big Apple). In addition, the Million Trees New York project (www.milliontreesnyc.org) will have planted one million trees in New York by 2015. New York is thus an ideal example for showing how natural capital valuation techniques can be put into practice.

Following the Total Economic Value framework, valuation begins by classifying the services provided by New York's urban forests. These services include:

- **Direct use values**: The value of the trees themselves. This is captured by looking at the replacement cost – this assumes that the value of the forest must be at least equal to what it would cost to re-create.
- **Indirect use values**: This is the dominant value category. Values here include the value of increased air quality, shade benefits such as reduced cooling costs in the summer, the reduced strain on the sewer system, and the increase in property values associated with trees.

Table 2: Valuation Methods for NYC's Urban Forests		
Value	**Method to Be Used**	**Details**
Direct Use Value	Replacement Cost	Calculate the cost of replacing all trees in their current condition
Indirect Use: Air Quality	Defensive Expenditures	Calculate the cost of replacing the air quality benefits with man-made alternatives, via the cost of pollutants
Indirect Use: Cooling Costs	Defensive Expenditures	Calculate the cooling effect of the urban forest on structures. Calculate what it would have cost to achieve same cooling with A/C
Indirect Use: Water Diversion	Defensive Expenditures	Examine the cost of water diversion through man-made means, scale to water diverted by urban forest
Indirect Use: Property Values	Hedonic Analysis	Estimate a regression model for real estate prices that includes tree characteristics. Apply results across the NYC housing stock
Non-Use: Existence Value	N/A	Will not calcuate existence value in this report. Typically a survey would be commissioned.

- **Existence and option values**: Many residents of New York have expressed their enjoyment of being near trees and green spaces, as seen through the incredible volunteerism for the Million Trees project. Assigning existence values would require implementing surveys, and so is beyond the scope of this report. Nonetheless, it is important to remember this aspect of the urban forest's value.

With the values identified, methods for valuing each must be chosen. Table 2 shows some methods to determine the value of these services.

The direct use value of New York's urban forest – the replacement value of the trees – is estimated to be $18.7 billion, or an average value of about $3600/tree.[4] There is wide variation in value across trees; the New York forest includes both nearly-irreplaceable trees more than 100 years old, as well as the multitude of saplings planted as part of the Million Trees Project, which are just starting to grow and gain value.

While replacement value is one part of the equation, the urban forest also provides valuable annual services, as identified in Table 2. Table 3 provides values for each of these services in turn.

Trees help to purify the air by filtering out pollutants such as carbon dioxide, sulphur dioxide, particulate matter and others. The value of the purification that trees provide can be calculated using the defensive expenditures method. This is done by examining the cost of replicating the services without using trees: what would it cost to filter one ton of fine particulate matter from the air, for instance. Because trees save this cost, this is the value of their services. An average tree in New York provides about $4 per year in air purification services, for an aggregate value of about $20 million/year

As a tree grows, its canopy expands, and at the same time, complex root systems also grow and spread. Both the visible tree crown and the root system have an important role to play in controlling wet weather effects. The leaves help regulate how much precipitation reaches the ground, while the root system absorbs water and helps control erosion. These combined effects work to reduce the strain on the city's sewers and water treatment plants during storms. By looking at the costs to build, operate and maintain city

Table 3: Annual benefits provided by urban forests in New York City			
Benefit	**Description**	**$ value (millions)**	**$/tree**
Air quality	Air pollutants absorbed removed and avoided by street trees.	$19.90	$3.83
Wet-weather flow and water quality	Reduced strain on water transportation and processing infrastructure from rain and wet-weather flow intercepted.	$40.92	$7.87
Energy savings	Energy saved through shading and climate moderation.	$27.65	$5.32
Carbon sequestration	Carbon sequestered from the atmosphere, net of decompostion and maintenance	$60.34	$11.61
Total benefit	Sum of economic benefits provided by urban forests.	$148.82	$28.62
Benefit cost ratio	Benefits to citizens for every $ spent on maintenance.	-	$5.95

Source: City of New York, Center for Urban Forest Research, Consolidated Edison, TD Economics.

sewage infrastructure, and the annual water flow through it, the additional cost to the city were there no trees to regulate precipitation can be determined. This additional water processing cost is equal to the annual service value of the trees' water diversion. The avoided cost is valued at $41 million per year, or nearly $8/tree.

Trees that grow near buildings provide shade in the summer, reducing the electricity costs associated with cooling buildings. Similarly, in the winter, trees help to reduce wind speeds. Lower wind speeds result in less cool air getting into buildings, and so reduce heating costs. Geospatial models that incorporate historic weather patterns can be used to model the heating and cooling cost reduction. By looking at the cost of electricity and natural gas, the average household savings each year as a result of nearby trees can be determined. These savings are substantial: the electricity saved each year is equivalent to the annual consumption of over 75,000 households (nearly four per cent of NYC households), with a value of about $28 million per year.

Properties that contain trees tend to sell for a higher price. Numerous studies have confirmed this result across many different cities. New York is no different. This result is found using 'hedonic' regression methods. In this approach, sale prices of homes are regressed on all of that home's characteristics – age, number of bedrooms, neighborhood, distance to amenities, and other characteristics, including trees on the property. By including all of a property's characteristics, the value that each tree adds can be determined, independent of other features. For New York, trees increases property values by approximately $90 per tree, increasing property prices across the city by approximately $60 million in total.

Overall, the environmental services considered provide nearly $150 million a year in benefit to New Yorkers.

Although New York's urban forest provides valuable benefits, it also requires maintenance; trees need to be planted, canopies maintained, sidewalks cleaned in the fall, and so forth. The forestry budget should also be taken into account when considering urban forest benefits. New York appears to be getting great value for its money: for each dollar spent on forestry, the urban forest returns nearly six dollars in benefits. It is worth noting that as the saplings planted under the Million Trees project mature, they will require increasing maintenance. However, the benefits they provide will also grow year after year.

New York City helps underscore the importance of including natural capital in the decision making process. Policies that reduce natural capital can have important, costly consequences, as shown in Table 3. Incorporating natural capital in decisions can lead to positive outcomes – for instance, urban trees and other forms of natural capital can play an important role in flood mitigation, at a relatively low cost of investment. This is particularly relevant in light of the impact hurricane Sandy had on the region. Considering the low cost of maintenance and all of the benefits provided, investing in and maintaining New York's urban forest is a winning proposition.

Case Study 2: TD Green Buildings

TD Bank, America's Most Convenient Bank™ has committed to building green retail stores across its business footprint. Why does TD find it important to commit to green? As will be seen, green buildings create a win-win situation, as natural capital is protected and facility operating costs are reduced. There are many important features of green buildings. For this analysis, the focus is on:

- **Renewable Energy**: by using solar and other renewables rather than traditional power sources, pollution is avoided in the day-to-day running of the store, and money is saved by reducing power bills.

Cypress Creek Florida Store

- **Enhanced Power Management**: incorporating automatic timers, network connected controls, and other features ensure that electricity is not wasted, and that the building is performing at peak ability.
- **Enhanced Property**: An emphasis on local trees and vegetation that reduces water usage and maintenance.

To illustrate the natural capital benefits, TD's net zero energy TD retail store in Cypress Creek, Fort Lauderdale Florida is considered. Solar cells that double as a roof for the ATMs combine with more traditional roof and ground-based

cells to give the branch a distinctive appearance. These cells generate as much energy as used throughout the year, making the store "net zero" in terms of electricity use.

The solar cells not only save electricity costs, but also benefit surrounding communities: As of September 2014, the Cypress Creek store has produced over 160 cumulative mega-watt hours of electricity – the result of which is avoided CO2 equivalent emissions of nearly 100 tons (about 49 tons/year). This is equivalent to the emissions produced by 10 homes over the course of a year. By avoiding these emissions, the store helps to reduce the strain on natural capital in the area.

Beyond the electricity generation, new TD stores are being built with the latest automation equipment, including network connected controls. These features help ensure that energy is not wasted, and that the features of the store are always working at peak efficiency, expending energy only when needed, keeping operating costs low.

Wherever possible, new stores incorporate native plants into the landscaping. By choosing native plants, local biodiversity is maintained, while at the same time maintenance costs, such as watering, are reduced.

These green features have a significant impact on operating costs, and help protect natural capital in the area by reducing the strain placed on it. For the Cypress Creek store the improvements made relative to traditional branches create savings - both in operating costs and natural capital impacts - of over $100 thousand per year for TD and for those living or working in the area. This illustrates how incorporating natural capital into the decision making and design process isn't just good for communities; it's also good for the bottom line.

Bottom Line: Why Does Natural Capital Matter?

Natural capital is foundational to the economy, providing countless benefits year after year. As this report has shown, these benefits can be substantial. Natural capital isn't infinite however, and decisions made without considering the natural capital implications can be costly not just to businesses, but to society and the economy more broadly. Incorporating natural capital in the planning process results in smarter, better decisions for firms and the communities they serve.

Conversely, failure to incorporate natural capital can lead to sub-optimal decisions, and unrecognized costs that are often borne by society at large. Many firms, individuals, organizations, and governments are making progress towards including natural capital in the decision-making process, but progress is hampered somewhat by the lack of formal systems for natural capital valuation. However, as the case studies have shown, there is much to be gained by bringing natural capital into the decision process.

Beyond the business case, putting a value on natural capital is in many ways like putting a value on the future: incorporating natural capital into decision-making helps ensure that our children and grandchildren continue to benefit from today's natural resources.

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ENDNOTES

1 Clearly not all natural capital resources fit this definition – oil and mineral deposits are an obvious exception. The carbon offsets associated with afforestation projects would also be excluded, although the other benefits provided by trees would not be.

2 Source: The Economist, 23 April 2005 "Are you being served?"

3 Technically, a renewable resource with an infinite life can be valued as a perpetuity. The value of the resource would be given by the formula value = annual benefit / discount rate (%)

4 Source: Peper et. al 2007 "New York City, New York Municipal Forest Resource Analysis". Values have been adjusted to account for inflation as well as an assumption of slightly lower quality trees across the broader urban forest.