

InVEST

Integrated Valuation of Ecosystem Services and Tradeoffs



InVEST: Mapping and Valuing Nature's Benefits to Business

Businesses depend on the benefits that nature provides and affect the ability of ecosystems to provide these services. The Millennium Ecosystem Assessment—a five-year international study on the state of the world's ecosystems—determined that 60% of nature's benefits to humans, known as ecosystem services, are being degraded or used unsustainably. This can have significant implications for the business bottom line. To address this problem, there are increased efforts to calculate the value of ecosystem services, and the risks and opportunities they create for companies.

A Tool for Leveraging Opportunities and Minimizing Risks

Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) is a software tool designed by the Natural Capital Project to help businesses reduce risks and seize opportunities by valuing nature's benefits. InVEST is one of the leading tools for mapping and valuing multiple ecosystem services and is the only one available as an open-source software. InVEST quantifies nature's benefits in both biophysical terms, such as water flows, and economic terms, such as avoided cost or net present value. InVEST maps depict the ecosystem service returns of alternative business decisions and help companies manage trade-offs in operations, investments and management.



What are ecosystem services?

If properly managed, ecosystems yield a flow of services that are vital to humanity, including the production of goods (e.g. food), life support processes (e.g. water purification), life-fulfilling conditions (e.g. beauty and recreational opportunities), and the conservation of options (e.g. genetic diversity for future use). Despite their importance, ecosystem services are poorly understood, scarcely monitored, and, in many cases, undergoing rapid degradation and depletion. InVEST allows users to take into account ecosystem services and their relationship to human well-being.



WHAT DOES InVEST MODEL?

TERRESTRIAL MODELS

Carbon Storage and Sequestration

The amount and value of carbon sequestered naturally; for example, in soils and vegetation.

Crop Pollination

The contribution of native pollinators to enhance crop yields.

Water Purification (Nutrient Retention)

The amount and value of nutrient retention by vegetation and soil to avoid contamination of waterways.

Erosion Control

The amount and value of sediment retention by vegetation.

Reservoir Hydropower Production

The amount and value of water yield sub-watersheds contribute to hydropower production.

Flood Mitigation*

The risk and severity of floods, and damage estimates.

Biodiversity

Habitat quality and rarity, and risks to species.

Multiple Services from Lands and Waters

The amount and value of all or a selection of the ecosystem services listed above.

Fisheries

The amount and value of catch from capture fisheries (e.g., Pacific salmon, spiny lobster).

Aquaculture Harvest

The amount and value of farmed fish based on farming practices, water temperature, and economic factors.

Coastal Protection

The risk of exposure to coastal inundation and erosion during storms and value of natural habitats to reduce exposure.

Marine Recreation*

The location of high tourism rates and their overlap with ecosystem services.

Renewable Energy (wave, wind)

The potential energy from waves or wind and net present value of facilities at various sites.

Habitat Risk

Habitat types and risks posed to habitat by human activities and management regimes.

Aesthetic Quality

The aesthetic effects of offshore and onshore development.

Multiple Services from Coasts and Oceans

The amount and value of all or a selection of the ecosystem services listed above.

* model soon to be released

MARINE MODELS

InVEST in practice: Nature's Value at LaFarge

Lafarge North America teamed up with World Wildlife Fund and the World Resources Institute to understand their risks and opportunities related to ecosystem services at one of their active quarry sites: Presque Isle Quarry in Michigan.

InVEST was used to map and value two ecosystem services that were salient to Lafarge's operations: erosion control and water purification. Vegetation, such as trees and grass, can reduce the amount of soil that erodes into rivers and lakes, causing silt and sediment loading that af-

fects reservoirs and dams. Erosion regulation is especially important at Presque Isle Quarry to prevent excess sedimentation of Lake Huron. InVEST showed areas where the natural land cover plays an instrumental role in retaining sediment and the monetary value this service provides by avoiding dredging costs. It also identified areas where vegetation could be grown to reduce potential erosion into the lake.

Watersheds purify water by trapping nutrients, such as phosphorous and nitrogen, in vegetation and avoiding

HOW CAN InVEST HELP BUSINESSES?

Forestry and mining companies can obtain credits to sell in carbon markets by identifying how they can manage land-holdings to sequester carbon cost-effectively.

Agriculture companies can increase productivity by identifying where preserving pollinator habitat will increase crop yields and revenues.

Beverage and water treatment companies can minimize contamination of watersheds they depend on by identifying how to manage land upstream sustainably.

Hydropower companies can reduce the costs of removing sediment from reservoirs by identifying land areas upstream that are important for erosion control.

Hydropower companies can ensure more sustainable, reliable supplies of water and higher revenues through upstream land management to maintain power production.

Agriculture companies can avoid damage to crops and many corporations can decrease risks to infrastructure by identifying the locations and activities associated with flood risk.

Industries can consider where biodiversity overlaps with areas important for business or ecosystem services, which may be required for environmental assessments or mitigation.

Companies whose operations rely on natural resources can manage forests, wetlands, and grasslands to provide secure and clean sources of water, offset carbon emissions, and reduce risk of flood damage.

Fisheries industry associations can set catch limits by understanding how different fishing practices and locations can affect annual catch.

Aquaculture farms can reap profits by identifying how farming practices, location of farms, and climate change affect harvests.

The tourism industry can decrease costs by identifying risky areas to avoid when locating businesses or reduce risk by restoring natural habitat in vulnerable locations.

The tourism industry can coordinate with other marine sectors, by identifying areas that are important to protect for recreation.

Energy companies can gain more insight into which locations possess optimal energy potential and low transmission costs for energy produced.

Infrastructure developers can assess the possible risks to coastal and marine habitats of alternative development locations and methods.

Offshore renewable energy facilities, aquaculture developers, and the forestry industry can measure their potential impacts on aesthetic views to obtain project approval.

Businesses operating in coastal or near-shore environments can assess the cumulative impact of their operations on other services, as well as how activities from other sectors affect their operations and profits.

Water purification through nitrogen regulation services for Presque Isle Quarry: over 3,300 kg/year

contamination of rivers and lakes. Without this service from nature, companies have to pay to purify affected water by building treatment plants. InVEST was used to map and measure the water purification services provided by Presque Isle by calculating the amount of nitrogen retained by the site. Subsequent economic valuation showed that Lafarge's efforts to maintain vegetation provided a clear benefit by avoiding water treatment costs.

Further analysis indicated that once the quarry was closed, restoring vegetation could increase the erosion control, water purification, and recreational value of the site.



InVEST In Practice

Helping companies make cost-effective decisions

What can InVEST help companies do?

How does InVEST work in practice?

Improve sustainable sourcing strategies.

InVEST can identify less risky and more reliable sources of raw materials by mapping impacts on ecosystem services.

Integrate ecosystem service considerations into existing corporate environmental assessment and management processes.

InVEST can enhance the quality of Environmental Impact Assessments, lifecycle assessments, risk assessments, cost-benefit analyses, land-use plans, and off-site mitigation plans by showing the impacts of alternatives on the location, quantity, and value of ecosystem services.

Strengthen communications with stakeholders and shareholder engagement strategies.

InVEST maps can be effective visual aids when engaging with stakeholders, as well as at shareholder meetings, in annual reports, and in public relations materials.

Identify ecosystem service assets that can be marketed and help design payment schemes.

InVEST maps can identify where ecosystem services are supplied on company property, and who benefits from them, which can help to establish payments for ecosystem services and exploit emerging markets.

Augment corporate social responsibility and environment, social, and governance strategies by providing ecosystem service information.

InVEST can add depth to these strategies by depicting how decisions about managing land, water, and coasts could affect other users.

Leverage investment and favorable lending terms from institutional lenders and socially responsible investment indices and firms.

With available data, InVEST can produce detailed maps of ecosystem services.

Attain first-mover advantage when integrating ecosystem services into operations and management policies.

InVEST software is free, open source, and flexible. It is currently the market leader in mapping and valuing ecosystem services.

Download InVEST at:
naturalcapitalproject.org/download.html

The Natural Capital Project

The Natural Capital Project aims to align economic forces with conservation. NatCap is a joint venture among Stanford University, the University of Minnesota, The Nature Conservancy, and the World Wildlife Fund. We develop tools that make it easy to incorporate natural capital into decisions, demonstrate the power of these tools in important contrasting places, and mainstream natural capital approaches by engaging leaders in key institutions.

More information: naturalcapitalproject.org

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For more information on the Lafarge InVEST application, see:
www.wbcds.org/web/ecosystems/RTSummaries/Lafarge_CEV_Summary.pdf



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