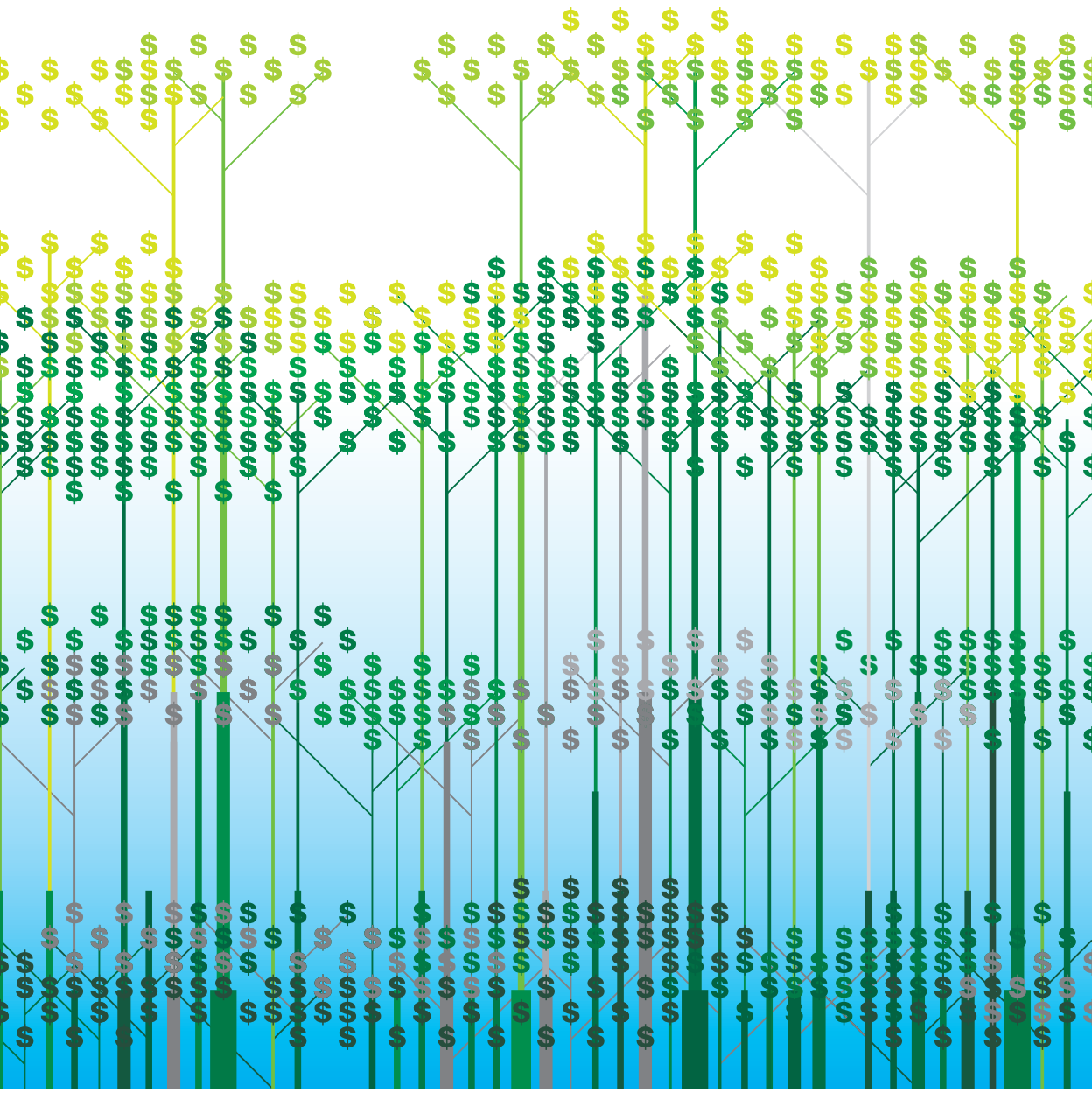
The Biosphere Economy

Natural limits can spur creativity, innovation and growth



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B4E Business for the Environment

Unless otherwise stated, all $ values in this document are in US dollars.

Volans is part think-tank, part consultancy, part broker and part incubator. Based in London and Singapore, Volans works globally with entrepreneurs, businesses, investors and governments to develop and scale innovative solutions to financial, social and environmental challenges. Our Pathways to Scale program aims to identify, map and remove barriers that slow the scaling of innovative solutions to governance, economic, social and environmental challenges.

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B4E is the Business for Environment Global Summit, the world's leading international conference for dialogue and business-driven action for the environment. The summit addresses the most urgent environmental challenges facing the world today. Key topics on the agenda include resource efficiency, renewable energies, new business models and climate policy and strategies.

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Tellus Mater Foundation is a grant-making trust that supports leaders to put in place solutions for a low carbon future. It seeks innovative solutions to shift political, economic, and financial institutions to a low carbon path.

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Global Initiatives Foreword

We begin to see a critical connection between climate change, the functioning of the biosphere and the economy. Whether it is about commodity markets behind deforestation, contributing to carbon emissions, or the disruption of hydrological cycles limiting access to renewable energy like hydropower. As these links become ever more apparent and resource scarcity increases, business leaders and investors will be among the first to realize the long-term business risks associated with eroding natural capital.

We are proud to partner with Volans to help shape this new agenda, and advance the opportunity for business leaders to turn planetary crises into opportunities. Their leadership and innovation can help trigger the wider changes that are needed by governments.

This timely report shows how CEOs and senior executives of the world's largest corporations can join leaders from governments, international agencies and NGOs to co-create new solutions. This remains largely uncharted territory, but Volans outlines an agenda that potentially provides the business community with a compelling platform for future action.

Tony Gourlay
CEO, Global Initiatives

Tellus Mater Foundation Foreword

Today's economy fails to account for the value of nature and the services it provides, like the provision of freshwater, clean air or the pollination of crops. Forward-thinking companies understand their dependency on natural assets to produce goods and services. A future economy must incorporate the means to fully value trade and manage natural capital. This will require a considerable re-design of basic market building blocks, from corporate valuations by investors to national accounts by governments. Systemic change in the way that businesses, markets and economies function is required.

In this report, Volans explores the future prospects for a Biosphere Economy. It reminds business leaders of the unprecedented level of risk we face as we surpass the planet's boundaries, but also of the leadership opportunities that exist for innovators, investors and governments to work together to catalyze change. Tellus Mater is pleased to support Volans, a dynamic new actor in the business of social innovation, as it unveils this leadership agenda. Drawing attention to those innovation opportunities and providing a compelling springboard for action are essential steps towards greater sustainability.

Jessica Brown
Director,
Tellus Mater Foundation

Executive Summary

Almost 200 years ago, Thomas Newcomen built the world's first commercially successful steam engine—to pump water out of deep coalmines. In the process, he handed humanity the keys to the Earth's fossil fuel resources, an event which in turn helped fuel the Industrial Revolution. Ever since that moment, the natural world has been in retreat, equally undervalued by economists, accountants, engineers and politicians. Now, however, a new revolution is under way, once again ignited by resource constraints—but this time with economists and accountants leading the charge, alongside activists, engineers, scientists, business leaders and, eventually, politicians.

Take Pavan Sukhdev, former managing director of the Markets Division of Deutsche Bank—who later in 2010 will launch the findings of the TEEB study,[1] the acronym standing for 'The Economics of Ecosystems and Biodiversity', an initiative of the United Nations Environment Programme (UNEP). The focus of his work—and of a growing number of economists—is the creation in the coming decades of what we will call here the 'Biosphere Economy'. And the evidence suggests that this will be as profound in its impacts as the original Industrial Revolution, with the critical difference that this time that the economy will be working with the grain of the biosphere, rather than against it.

"We are building a new economic compass for policy decisions in order to change incentive structures, reduce or phase out perverse subsidies, and engage business leaders in a vision that recognizes the value of nature's services and the costs of their loss."

Pavan Sukhdev

Study Leader, TEEB and Special Advisor & Head, Green Economy Initiative, UNEP

The financial value at stake is mind-boggling—and the business opportunities likely to be created by the shift in the prevailing market paradigm are astonishing. The TEEB analysis, for example, concludes that the degradation of the Earth's ecosystems and biodiversity due to deforestation alone costs us natural capital worth somewhere between $1.9 and $4.5 trillion every year.

Extraordinary new insights are flowing from the leading edge of ecosystems science. Today we understand, for example, that tropical rainforests act as freshwater pumps. The Amazon generates and pumps into the atmosphere some 8 trillion tons of water a year, feeding into an aerial belt of water vapor that connects tropical forests across the globe. Cut down the Amazon, we are told, and rainfall will decrease from South America to Tibet, generating (to take just one example) water scarcity in Brazil, where the energy supply sector is 70% dependent on hydropower.

Conserving the Amazon is therefore not just a matter for conservationists, but a strategic issue for the companies whose operations make up the $1 trillion agricultural industry in southern Brazil and Argentina. Indeed, the emerging business case for investment in ecosystem services promises to be significantly more engaging for business leaders than earlier emotional appeals to protect biodiversity.

Enter the Biosphere Economy, a future where business-as-usual and politics-as-usual increasingly take account of natural capital and related forms of value, bridging the gap between man-made assets and nature's ecological infrastructures that underpin our economies and societies.

Around the world, a growing array of innovators is experimenting with possible solutions. They range from earth scientists co-developing investment ratings for companies through to technology firms creating open-source mechanisms to track the state of the biosphere. We plan to map and engage a growing number of these innovators and entrepreneurs, helping cross-connect them with each other—and with the mainstream business, financial and public sector players they must now engage.

The four business trends spotlighted in this short brief—relating to leadership, finance, operations, and innovation—are shaping an agenda for those in Boards and C-Suites. As a first step in our work on the pathways to scale of the Biosphere Economy, we are delighted to be engaging leaders from the private, public and citizen sectors at the 2010 Business for Environment (B4E) Summit in Korea. It is tempting to say that this is a shared challenge—and a shared opportunity—but history suggests that some actors will recognize the market potential in all of this, way ahead of others. Who will be the Bill Gates of ecosystem services?

Alejandro Litovsky
Director, Pathways to Scale,
Volans

John Elkington
Co-Founder and Executive Chairman,
Volans

Introduction

Welcome to the Biosphere Economy. What follows is a business brief on one of the great boom industries of the coming decades: ecosystem services. The brief draws on ongoing work by Volans, funded by the Tellus Mater Foundation and is designed as a key input to a global business agenda for action.

Our species has hit natural boundaries at different points in its history, with entire civilisations sometimes collapsing in the process. But we are living through the first time in our evolutionary progression where some of the limits we face are planetary in scale. The solutions are also going to be developed and deployed at a scale.

A new revolution is under way, once again ignited by resource constraints—but this time with economists and accountants leading the charge, alongside activists, engineers, scientists, business leaders and, eventually, politicians. We call this revolution the 'Biosphere Economy'. And the evidence suggests that this will be as profound in its impacts as the original Industrial Revolution, with the critical difference that this time that the economy will be working with the grain of the biosphere, rather than against it.

The financial value at stake is mind-boggling. Already, global economic losses due to the degradation of ecosystems and biodiversity from deforestation alone is estimated to be running at somewhere between $1.9 and $4.5 trillion—every year. The resulting loss of natural capital hits us most directly through the loss of key services they provide, including humidity and temperature control, provision of freshwater, pollination of crops, and protection against extreme weather events.[2] On the positive side of the coin, however, the market opportunities likely to be created by the shift in the prevailing market paradigm are likely to be at least as extraordinary.

Ever since the Industrial Revolution, the natural world has been in retreat, equally undervalued by economists, accountants, engineers and politicians. Partly because of demographic pressures, partly because the global economy is already in ecological deficit—demanding more natural capital than the Earth is able to create in a single year, undermining the ecological equilibrium that sustains all human activity—the emerging leadership challenge will involve aligning population, social, economic and biosphere priorities in ways that drive new forms of value and growth.

This Biosphere Economy is moving away from 'intangible' ecosystem services such as naturally produced water, soil and clean air, to a set of tangible issues for business—and, in the process, shifting its focus from business 'externalities' such as pollution, deforestation, and resource degradation, to a re-consideration of market and corporate valuation mechanisms.

As scientific understanding of the value of ecosystems and biodiversity grows—value that until very recently has been taken for granted or simply discounted from the equation—so we see growing interest in pricing the services key ecosystems deliver, such as flood controls and rainfall regulation, creating the mechanisms whereby related payments can be made, and developing the businesses that will drive new forms of market value.

Estimates of the value of certified agricultural products suggest that the value of this part of the evolving ecosystem services market alone could grow from $42 million in 2005 to around $97 billion by 2012 (assuming a 15% annual growth rate) and then possibly increasing by a factor of ten to $900 billion by 2025—assuming an annual growth rate of 5% between 2020 and 2050.[3]

C-suite reactions[4]

So what do top business decision-makers make of all of this? One thing is clear: the business case thinking on ecosystem services promises to be significantly more engaging for many business leaders than emotional appeals to protect biodiversity.

As Mikkel Kallesoe of the World Business Council for Sustainable Development (WBCSD) told us: "The concept of ecosystem services is more tangible for business than biodiversity. We are talking about freshwater, crops, pollination, fiber and erosion regulation. These units fit with other inputs in a business model and a production process. We are going to see a profound shift from dealing with environmental issues as risk management challenges to developing new business opportunities by acknowledging a company's dependence on ecosystems."[5]

So what do we mean when we talk about the services provided by nature? And what does all of this imply for business? By way of an initial answer, let's take two illustrations from a study by PricewaterhouseCoopers (PwC) for the World Economic Forum (WEF), published early in 2010.

—Syngenta tackled the looming threat to agricultural yields posed by a decline in pollinating insect populations with its 'Operation Pollinator', designed to support farmers in turning marginal land into habitats for natural pollinators.

C-Suite refers to a corporation's most senior executives, who often have the term 'Chief' in their title, denoting hierarchy and responsibility, as in Chief Executive Officer, Chief Financial Officer, and Chief Operating Officer.

But beyond this traditional trinity is a growing number of roles like Chief Technology Officer (CTO), Chief Innovation Officer (CIO), Chief Marketing Officer (CMO), Chief Responsibility Officer (CRO), among many others.

—Vittel (Nestlé Waters) responded to the contamination of groundwater by agricultural nitrates by compensating farmers for cutting their nitrogen use—and, crucially, supporting them as they converted to more sustainable agriculture practices. As PwC noted: "Vittel spent $32 million in the first seven years of the program, a small sum relative to the cost of plant closure, relocation, or brand damage which befell some competing brands."[6]

But how much of this is registering in today's corporate boardrooms? The answer seems to be very little—except in the relatively rare cases where companies are directly dependent on threatened or controversial ecosystem products and services for their licence to operate, revenues and/or profitability.

Earlier in 2010, the CEOs of 29 global companies involved in WBCSD—including Alcoa, Boeing, Syngenta, Sony, E.ON, Procter & Gamble, Duke Energy, Toyota, Infosys and Volkswagen—unveiled their *Vision 2050*. They picture a future in which market pricing accurately reflects the ecological costs of doing business. Over time, it is likely that we will become much more acutely aware of our dependence on, for example, the hydrological and carbon cycles, and, even if less obvious, the pollination services provided by bees and other insects.[7]

Most CEOs, CFOs and COOs have been too busy coping with the impacts of the economic downturn to think outside of a short term planning horizon to consider the long-term risks associated with rapidly eroding natural assets. Even the growing number of Chief Sustainability Officers (CSOs) tend to focus on more politically contentious issues like climate change and, in some regions, water availability.

This is worrying in three respects: first, we may overshoot natural limits with no sense of the significance of what is happening; second, there is a linked threat that business will be blind-sided by unforeseen risks associated with disrupted ecosystem services; and, third and more positively, businesses—indeed entire economies—may miss out on the opportunity to create the technologies, business models and markets of the future.

Rewiring the C-suite Dashboard

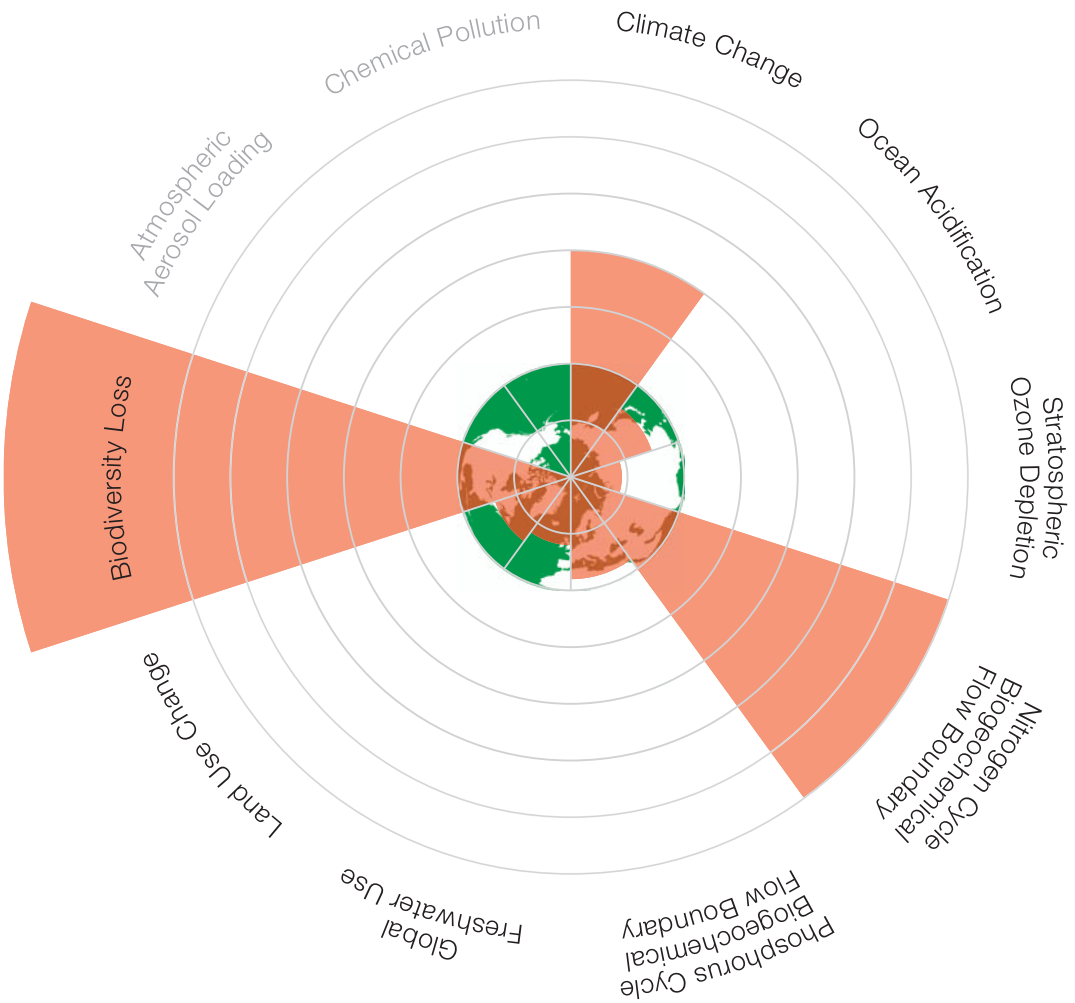
So what information will business leaders need to have displayed on the C-Suite dashboard in the future? Where is the necessary innovation happening, and what can be done to accelerate the pace at which emerging solutions achieve scale?

As far as the dashboard is concerned, starting points would include the sort of visuals produced by the Stockholm Resilience Centre (Figure 1) and the Global Footprint Network (Figure 2)—though these will need to be adapted to the specific circumstances of a given company.

Figure 1 underscores the fact that while the world has been obsessed by the climate change challenge, for good reasons, a range of other challenges are emerging which are of significance for business—shown here in terms of nine planetary boundaries. If we move outside the area of planetary resilience, as the science suggests we already have done in two of the nine areas—biodiversity loss and the nitrogen cycle—then the chances are that we will loose significant freedom of manoeuvre in dealing with the other boundaries.

Figure 1

Planetary Boundaries[8]



The red circle represents the boundary of the proposed safe operating space for nine global systems. The boundaries for Biodiversity Loss, Climate Change and the Nitrogen Cycle have already been exceeded. Atmospheric Aerosol Loading and Chemical Pollution are not yet quantified.

Adapted from: 'A safe operating space for humanity', *Nature*, by Johan Rockström, Will Steffen, Kevin Noone, Asa Persson, F. Stuart Chapin et al, September 23, 2009.

Figure 2 draws on work that tracks human demands on the biosphere, measuring the ecological footprint of people, businesses, cities and countries. In each case, the Ecological Footprint measures human demand on the Earth's resources, showing whether countries are ecological creditors or are in 'ecological overshoot'—consuming more resources than are locally available.

Not surprisingly, highly industrialized countries like the USA and Switzerland run significant ecological deficits. Less obviously, Iran's overuse of its resources adds pressure to a complex cocktail of social, economic, and political tensions. On the other hand, Russia's vast ecological resources contrast with the lack of transparency and accountability reflected by the absence of historical data.

Brazil's data, interestingly, shows a current surplus, but on a declining trend, spotlighting the potential opportunity for such countries to adopt a long-term, strategic approach as ecological creditors.

Tipping Point

As a result of such intelligence and the linked politics, we will see growing concern about energy, water and food security—and, in parallel, a growing interest among leading companies in developing and deploying new footprinting tools and techniques that track energy, carbon, water and other key areas of impact and vulnerability.

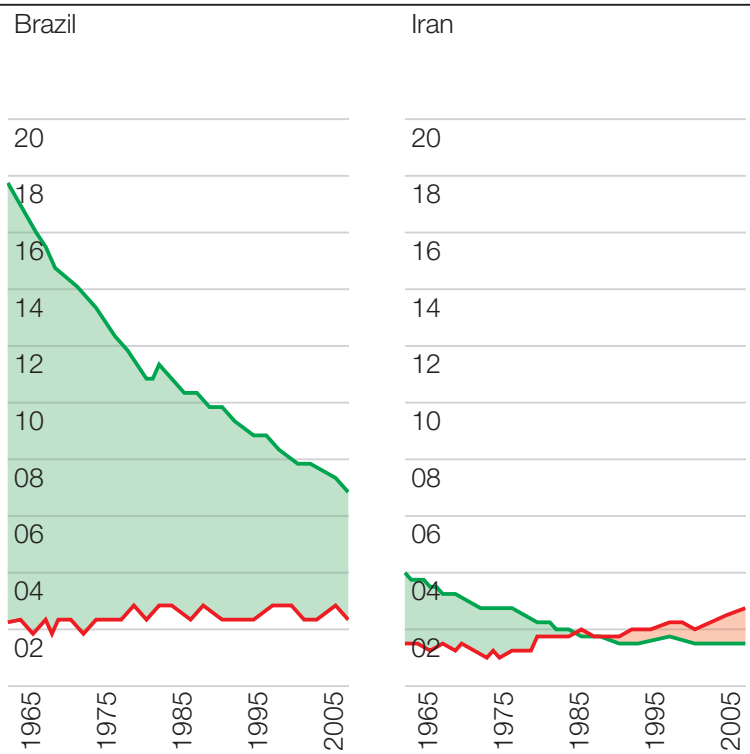
In the process, a movement that started by trying to preserve natural assets—the world's first truly national park was launched at Yellowstone in 1872—and then moved on to conservation, involving the active management of species and habitats, is beginning to jump to a very different level.

Figure 2

Ecological Footprint and Biocapacity [9]
Global Hectares Per Person
1961–2005

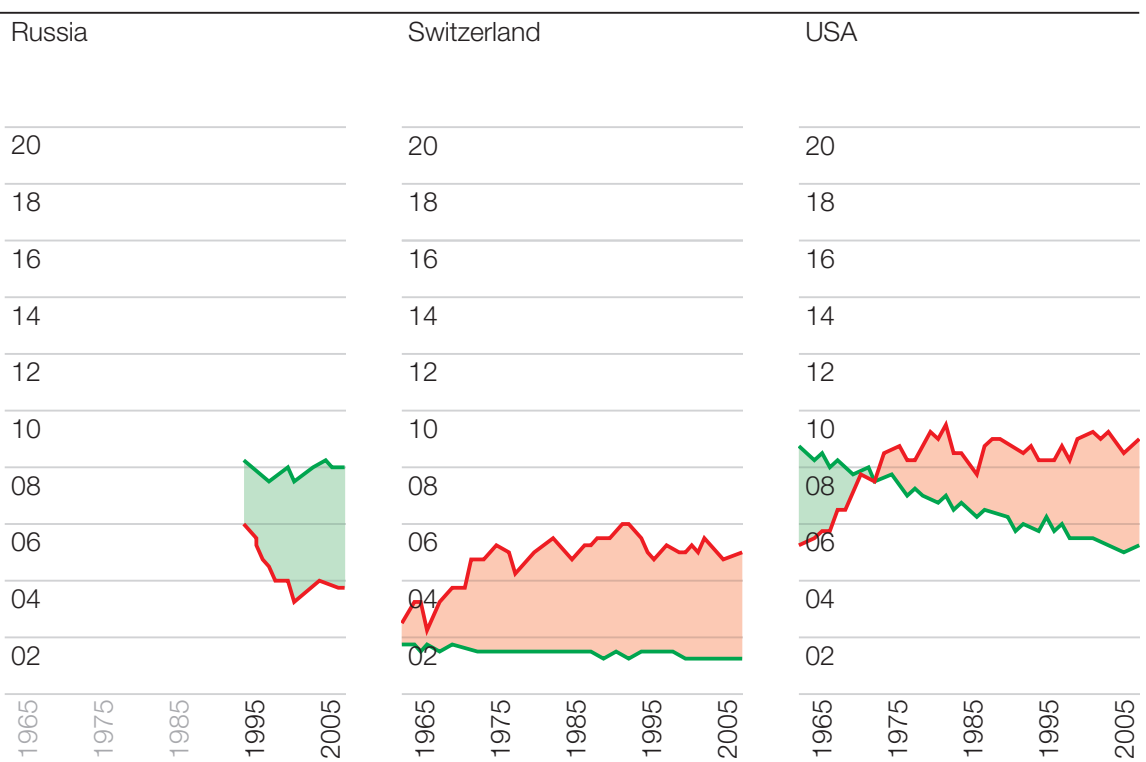
A country runs an ecological deficit if its footprint exceeds what its ecosystems can renew. The deficit is made up through net-imports, net-carbon emissions to the global atmosphere, or local resource degradation.

Adapted from 'The Ecological Power of Nations: The Earth's Biocapacity as a New Framework for International Cooperation', Global Footprint Network, 2009.



Those who have been raised in the world of conservation may find it hard to adjust to a future where ecosystem assets and services are priced, invested in and traded, but this is an experiment that the world is now embarked upon—and must energetically pursue.

In the following sections we spotlight some of the most interesting innovators, entrepreneurs and investors now at work in this space. Throughout 2010 Volans will be working with some of these leading individuals to identify and seek to remove some of the key barriers they face in creating larger-scale impacts on markets and the economy. A second report, towards the end of 2010, will analyse their thinking on how to scale the Biosphere Economy.



Four Critical Trends

Decision-makers will increasingly confront challenges that counter-pose the economy with the biosphere—partly because of demographic pressures, partly because we are already overriding natural limits. The emerging leadership challenge will involve aligning economic and biosphere priorities in ways that drive new forms of sustainable growth.

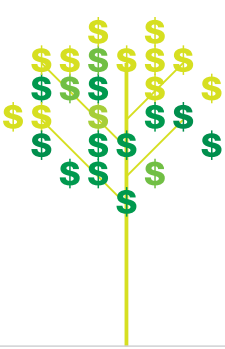
As ecological overshoot begins to blink at the edge of business risk detection screens, and—to a lesser extent as yet—of financial institutions, a growing array of innovators is experimenting with solutions to better align the global economy with the biosphere. These innovators are not the usual suspects. They range from canopy scientists developing investment ratings for companies through to technology firms creating mechanisms to track the state of the biosphere.

This emerging landscape of innovation is creating new opportunities for business to engage. But, practically, what does this mean for the corporate C-Suite? The four trends spotlighted below illustrate new opportunities around leadership, finance and markets, operations and supply chains, and, importantly, innovation.

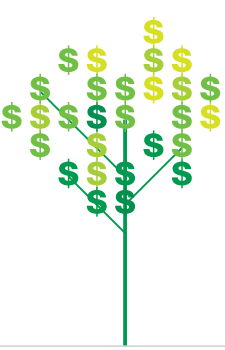
1
Business
Leadership

2
Markets and
Finance

3
Operations and
Supply Chains



4
Nature-Inspired
Innovation



1 Business Leadership

First, what makes all of this a potential Chairman or CEO issue? The leadership agenda has evolved as a series of societal pressure waves impacted governments, business and financial markets. The agenda here is moving from previously 'intangible' ecosystem services such as naturally produced water, soil and clean air to a set of tangible issues for business—and a shift from a focus on business 'externalities' such as pollution, deforestation, and resource degradation, to the re-consideration of market and corporate valuation mechanisms.

In the process, we have gone from a largely compliance-driven agenda, with governments leading the charge, to an increasingly market-driven agenda. Recent years, however, have seen a distinct shift towards a new focus on entrepreneurial and—crucially—scalable solutions, with growing interest in innovators and entrepreneurs. In the coming decade, issues around biodiversity and the biosphere look set to crowd onto the private, public and citizen sector agendas.

The drivers of this trend include a growing awareness of the economic dimensions of ecosystem services, as development pressures compromise services previously taken for granted. Just as the Stern Report on the economics of climate change introduced a new way of thinking on the climate challenge, spotlighting, for example, the $200 billion in losses due to extreme weather conditions in 2005,[10] so today initiatives like the TEEB study[11] look set to achieve a similar effect with the natural capital agenda and the growing connectivity between the two agendas.

While a corporate Chairman or CEO may regard these issues as public goods that fall in the realm of government regulation, the magnitude of business risks and associated opportunities is also opening new spaces for leadership. Recall GSK CEO Andrew Witty's decision to launch a new program of price reductions for medicines in a number of poorer countries, simultaneously addressing the troublesome debate of access to medicines while wrong-footing key industry competitors. The ecosystem services agenda offers a new access agenda with similar leadership opportunities for business.

"It is only a question of time until a financial analyst, looking at the valuation of companies such as utilities, or food and beverages, begins to consider (knowingly or not) ecological factors which threaten their business."

Chris Knight

Assistant Director, Forestry and Ecosystems, Sustainability and Climate Change, PricewaterhouseCoopers LLP UK [12]

Later this year, Trucost, a firm that is introducing environmental valuations to the business mainstream, will publish a report concluding that the 3,000 biggest public companies in the world had 'ecosystem liabilities' of US$2.2 trillion in 2008, representing on average over 30% of their combined profits. Trucost aims to increase the awareness of global markets to the risks associated with the externalities of business-as-usual—and is part of a larger field of players aiming to change the way companies are valued.[13]

Governments, while typically slower to respond, are also considering regulation to manage ecological limits more effectively with knock-on effects for business, from changing land-use policies to the reform of subsidies. In 1998, for example, the severity of the floods along China's Yangtze River floodplain affected 250 million people, with estimated losses of $20 billion. Swiss Re, the reinsurance company, and the Chinese Academy of Sciences, established a clear connection between the floods and deforestation in the upper river basin. As a result, the Chinese government now plans to convert vast areas of cropland back into forest and grassland, banning a number of industries and planning investment in natural capital assets (such as forests) of $100 billion, to regulate water flows for hydropower, irrigation, and flood prevention.[14]

As Andreas Spiegel, the Vice President for Risk Management at Swiss Re, told Volans: "The degradation of mangroves and deforestation increases the risk exposure to floods and tropical cyclones. At a time when climate change is pushing risk premiums, investing in natural ecosystems and ecological infrastructures is among the cheapest solutions when it comes to adapting to extreme weather events." [15]

Among the innovators tailoring ecosystem metrics for business is Gretchen Daily, co-founder of the Natural Capital Project, a 10-year joint venture of Stanford University with the Nature Conservancy and the World Wildlife Fund. One of their solutions is InVEST, a software tool whose name stands for the Integrated Valuation of Ecosystem Services and Tradeoffs. InVEST quantifies the ecological assets in a region—and models how their value will change under alternative scenarios. The metrics developed to assess the biophysical and economic value of ecosystem services are intended for integration into business strategy and policy decisions.[16]

$1.9–4.5 trillion

The estimated range of the value lost in natural capital due to the degradation of the Earth's ecosystems and biodiversity loss.

2 Markets and Finance

Next, what makes all of this an issue for Chief Financial Officers and Chief Investment Officers? Rising insurance premiums are probably likely to top the list of answers, as insurance (and, even more importantly, reinsurance) companies make connections between climate change and ecological limits, concluding that ecosystem-related crises could hit some economies and industries more rapidly than climate change itself.

Changes are already underway in terms of how corporate assets and liabilities are calculated, potentially influencing how natural assets find their way onto balance sheets and corporate accounts. The Biosphere Economy will likely drive a number of important changes to the way financial institutions work, with institutional investors—from banks to pension funds—having to review how they assess risk and manage long-term value.

Unusual industry alliances are seeking to change mindsets in the insurance sector. In 2009, Swiss Re led the Economics of Climate Adaptation Working Group with McKinsey & Company, ClimateWorks (an international network of foundations), the European Commission, the Rockefeller Foundation and Standard Chartered Bank. Their report concluded that climate risks could cost nations up to 19% of GDP by 2030, and recommended investment in ecosystem services as a way to increase resilience to climate change and manage the associated risks.[17]

Despite all of the above, the crossover between climate and ecosystems is as yet poorly understood by investors. But innovation is under way, for example with the Swiss asset management firm Prix Pictet being the first to incorporate the ecological footprint in the rating of long-term risk associated to country bonds,[18] and the London-based investment fund Earth Capital Partners creating an 'Earth Dividend' metric to analyze investments with a screen that integrates climate, natural assets and ecosystem considerations.

The primary innovation driver here is the management of long-term risk in an investment portfolio. For example, companies in the agricultural industry operating in South America's grain hub—an industry estimated to be worth $1 trillion in Argentina and southern Brazil—will be surprised to learn that rainfall patterns in the region are regulated by the Amazon rainforest, which pumps and moves an estimated 8 trillion tonnes of water into the atmosphere annually.

"Global players need to recognize that the world is made up of interacting systems and that a global view is increasingly essential. A tidal wave generated in one region of the world can devastate the infrastructures we insure in another region. It is clear that our man-made infrastructures and Nature's ecological infrastructures are becoming increasingly interdependent."

Julia Gray

Head of Sustainable Development and Environmental Management, Allianz Group [19]

This has led the Global Canopy Programme (GCP) to create the concept of tropical rainforests as 'Eco-Utilities', and explore a range of innovative financing mechanisms with which to sustain the value of these services. Even if governments are slow to respond, the magnitude of the risk involved for companies and investors will require innovation, along the lines of what GCP calls 'Proactive Investment in Natural Capital', or PINC for short.[20]

As Richard Burrett (a partner at Earth Capital Partners and Co-Chair of the Biodiversity and Ecosystem Services workstream at the UNEP Finance Initiative) told us: "Investors believe they are better informed because they have the power to model and analyze financial data on a second-by-second basis, but in reality we've been building ever more risk into the system because of an inability to see the long-term value of natural capital assets." [21]

Innovation by the investor community is also seen in the investor-led initiatives, such as: the US-based Ceres' Investor Network on Climate Risk (INCR), which brings together 80 investors with over $8 trillion in assets; and the P8 Group, a group of senior leaders from some of the world's largest public pension funds representing over $3 trillion of investment capital.[22]

As a result of such efforts, investor-backed disclosure requests to companies are becoming a growing concern for business, not least because many initiatives deal separately with climate emissions, water, forests or biodiversity.[23]

Market Sizes

New markets are emerging in the ecosystems space, with marketplace intelligence provided by firms like the Katoomba Group and Ecosystems Marketplace, both part of Forest Trends. The biggest market is for carbon, with the world market growing from $11 billion in 2005 to $32 billion in 2006, $64 billion in 2007, $126 billion in 2008 and being forecast to reach $170 billion in 2010 and $3.1 trillion dollars in 2020, with $1 trillion of that value relating to the USA.[24]

Other growing ecosystem-related markets include: $3.4 billion of regulated biodiversity offset transactions per year,[25] water ($500 million in 2010), and 'forest carbon' ($149.2 million in 2008). Currently, there are at least 40 local water quality market experiments in the USA.

Mainstream banks already playing into this space include JP Morgan, which bought both the carbon broker Ecosecurities (for $130 million) and the offset intermediary Climate Care. Goldman Sachs is also increasingly active through its GS Sustain, while a steady trickle of new investment firms, among them EKO Asset Management Partners, are being formed to work in this space.

While most of these markets are still voluntary, and many focus on offsetting business impacts, other experiments are emerging that aim to direct capital flows to sustain ecosystem services. One example focuses on the creation of 'forest bonds', driven by an agreement between UK-based Canopy Capital and the Government of Guyana. The central idea is to channel capital to preserve forest services such as rainfall generation, moderation of extreme weather, carbon storage and biodiversity maintenance. The shape of things to come?

3 Operations and Supply Chains

Some have already decided to do it, others know it is coming, while others are sublimely unaware, but growing numbers of Chief Operating Officers (COOs) will be confronted with the complex challenge of driving the environmental footprint of their operations towards zero. The challenge will often be to their underlying business model—and to the relevant design, production, supply and distribution thinking and processes.

COOs will be in the spotlight as institutional investors and shareholders back disclosure requests. The Carbon Disclosure Project (CDP), for example, requests carbon emissions data from companies on behalf of 534 institutional investors, holding $64 trillion in assets under management. Since their first request for the disclosure of emissions in 2003, the number of companies disclosing to CDP has grown 10-fold to 2,500 organizations in 60 countries.[26]

Interestingly, too, CDP is now in parallel developing the Water Disclosure Project, adding to a range of water footprint initiatives for business, including WBCSD's work on water and the work of the Water Footprint Network.[27] Other drivers may well include biodiversity certification, with Brazil's Instituto LIFE (Lasting Initiative for the Earth) already engaging large Brazilian companies, the UN Convention for Biological Diversity and the Brazilian government.[28]

In turn, the success of CDP has become a model for others, with the Global Canopy Programme creating the Forest Footprint Disclosure Project (FFD), which seeks to produce publicly available information on the direct and indirect impact of companies on forests. FFD's disclosure request is backed by 35 financial institutions with $3.5 trillion in collective assets under management. In 2009, FFD targeted 200 companies likely to be have exposure to forest-risk commodities such as beef or leather, palm, soy, timber or bio-fuel—with the disclosure requests directed to their CEOs, and then often cascaded to COOs.[29]

A central challenge for business is that the overall agenda has emerged on an issue-by-issue basis, with a range of alternative, yet often complementary, initiatives per issue. "You can't expect business and the financial industry to run a series of different systems for water, carbon, forests, and others all separately," we were told by Richard Burrett of Earth Capital Partners, who previously led ABN Amro's efforts on project finance and sustainability. "There is a resource constraint to doing this within companies, and eventually we will need to develop a lens that addresses all the issues holistically, progressively involving governments as regulators." [30]

$8 + $3 trillion

The assets held by investors participating in the US-based Ceres' Investor Network on Climate Risk (INCR) and the P8 Group which advances the involvement of pension funds in climate solutions.

Among those investor-linked initiatives looking at footprints more holistically is the Natural Value Initiative (NVI), a partnership between the NGO Fauna & Flora International, the United Nations Environment Programme's Finance Initiative (UNEFI) and Fundaçao Getulio Vargas, a Brazilian business school. NVI works in partnership with six institutional investors, including Aviva Investors, F&C Investments, VicSuper, Pax World, Insight Investment and Grupo Santander Brasil. In 2009, NVI tested a first round of its Ecosystem Services Benchmark with companies, publishing a ranking of 31 companies in the extractive, food, beverage and tobacco sectors.[31]

Another potential reference point for COOs looking to integrate ecosystem services within their business systems is the Corporate Ecosystem Services Review (ESR), a partnership between the World Resources Institute (WRI), the World Business Council for Sustainable Development (WBCSD), the Meridian Institute and Pricewaterhouse-Coopers (PwC). This has made considerable progress towards a methodology that connects business activity with the health of ecosystems. ESR analyzes a company's dependence and impact on ecosystem services, and then identifies key risks and opportunities. This has already been applied by some 300 companies worldwide.

Now WRI and the United Nations Environment Programme (UNEP) are taking this a step further, exploring how to mainstream ecosystem services within corporate decision-making, and in particular looking at potential cross-over points with ISO standards, and the Global Reporting Initiative's (GRI) guidelines. The GRI team also initiated work in 2010 on what ecosystem services imply for the performance measurement and reporting of companies. WBCSD is leading the Ecosystem Valuation Initiative, which is testing with 16 member companies a model that anchors ecosystem services valuations within core business areas, with early findings to be launched later in 2010.

$64 trillion

The assets held by the 534 institutional investors that request the disclosure of carbon emissions data from companies as part of the Carbon Disclosure Project (CDP).

4 Nature-Inspired Innovation

The Biosphere Economy is clearly about risk—but it's also about new forms of opportunity. We see an accelerating shift from chemistry, physics and engineering as models for economic thinking and development, to biology, ecology, and bio-, molecular- and nano-engineering. The work of people like Craig Venter on algal biofuels (the focus of a $600 million joint venture between his firm Synthetic Genomics and ExxonMobil) is part of the story, but longer term his work on synthetic biology—where totally new organisms are built from scratch—will not only disturb many environmentalists but also potentially lay the foundations for a very different global economy.[33]

In parallel, we expect to see growing interest from Chief Innovation Officers and Chief Technology Officers in the rapidly emerging field of biomimicry.[34] The vision of innovators such as Janine Benyus of the Biomimicry Institute[35] is of a growing symbiosis between business and biological cycles, demonstrating practical ways in which business can draw from nature's 'design intelligence'—and progressively engaging others, like the Designers Accord, to spread the new thinking and models through the business and design communities.[36]

Recent biomimicry-inspired designs include: commercial buildings in Africa that incorporate the design principles of termite mounds to provide natural ventilation; solar cells that mimic the compound eyes of insects to increase the efficiency of sunlight reception; or ocean power systems that are inspired by the swaying motion of sea plants and the propulsion mechanisms of shark, tuna, and mackerel. The Biomimicry Institute has made these and other design ideas available through an open-source project called 'Ask Nature'.[37]

Within this opportunity space, we also spotlight the work of people like William McDonough and Michael Braungart, who in 2002 published their 'cradle-to-cradle' manifesto, calling for the transformation of industry through ecologically intelligent design. They argue that designers can build on the growing knowledge of living earth systems. By employing the intelligence of natural systems—the effectiveness of nutrient cycling, for example—business can create products, industrial systems, buildings, and regional plans that allow nature and commerce to fruitfully co-exist.[38] Others in this field include Paul Hawken, Amory Lovins and Hunter Lovins with 'Natural Capitalism' as a new way of thinking about industrial design, and Gunter Pauli of the Zero Emissions Research and Initiatives (ZERI), who is looking at new entrepreneurial business models based on the sort of cascading nutrient cycles found in nature.[39]

"The biggest impact for business is likely to come through investor interests and corporate valuations. Ecosystem services will certainly change the way in which reported information on corporate performance is used and understood by a company's stakeholders and shareholders."

Sean Gilbert

Global Reporting Initiative [32]

Meanwhile, a new wave of entrepreneurs and start-up companies is building on the work of these early pioneers. In the UK, for example, ModCell is producing construction materials from straw and hemp, materials that ultimately reintegrate into nutrient cycles—but in the meantime provide building blocks for commercial buildings and houses that offer a thermal performance up to three times better than current building regulations require.[40]

Businesses looking to integrate nature's intelligence into the design of products and processes also need better information flows and intelligence on the state of Earth's living systems. Need is spurring a second wave of innovation, driven by large technology companies. These efforts include: IBM's Smarter Planet initiative,[41] which aims to create information and intelligence platforms to help tackle some of our most complex problems, including improved energy, water and transportation infrastructures; and the newly created Planetary Skin Institute, a global partnership between Cisco and NASA, which aims to provide an online collaborative platform to process data from satellite, airborne and sea- and land-based sensors around the globe, translating the data into information that governments and businesses can use to mitigate and adapt to climate change.[42]

Google, meanwhile, is leading the way through Google Earth Outreach, unveiling innovative partnerships with the likes of the Surui indigenous tribe in the State of Rondonia in the Amazon, who will track deforestation on the ground and feed back so called 'ground-truth' information into Google Earth's imaging.[43] The company has now launched its Earth Engine in partnership with the Carnegie Institution for Science, IMAZON (the Brazilian satellite imaging initiative that is tackling deforestation in the Amazon) and the Gordon and Betty Moore Foundation.

Currently at the prototype phase, Earth Engine will make forest monitoring—traditionally a complex and expensive endeavor—both easier and cheaper. By supplying the data, storage, and computing abilities, Google will ensure that forest changes can be spotted in fractions of a second over the Internet and, critically, will make the technology available free to tropical countries to support forest monitoring programs.[44]

Trends such as those spotlighted above do not guarantee a steady transition to a sustainable biosphere economy, not least because of the expected systemic pressures as the world heads towards a projected human population of some 9 billion people by mid-century. But there are clearly a growing number of tremendously interesting building blocks in formation—many of which can be scaled given the necessary political leadership from the public, private and citizen sectors. To that end, our final section sketches to-do lists for business, financial markets and governments.

"The economic growth of the last two centuries has relied on the mismanagement of natural assets. Governments are starting to understand that making these assets visible in national accounts and economic strategies is the key to growth in the 21st Century."

Achim Steiner

UN Under-Secretary General and Executive Director of the UN Environment Programme (UNEP)

Agenda for the Second Decade

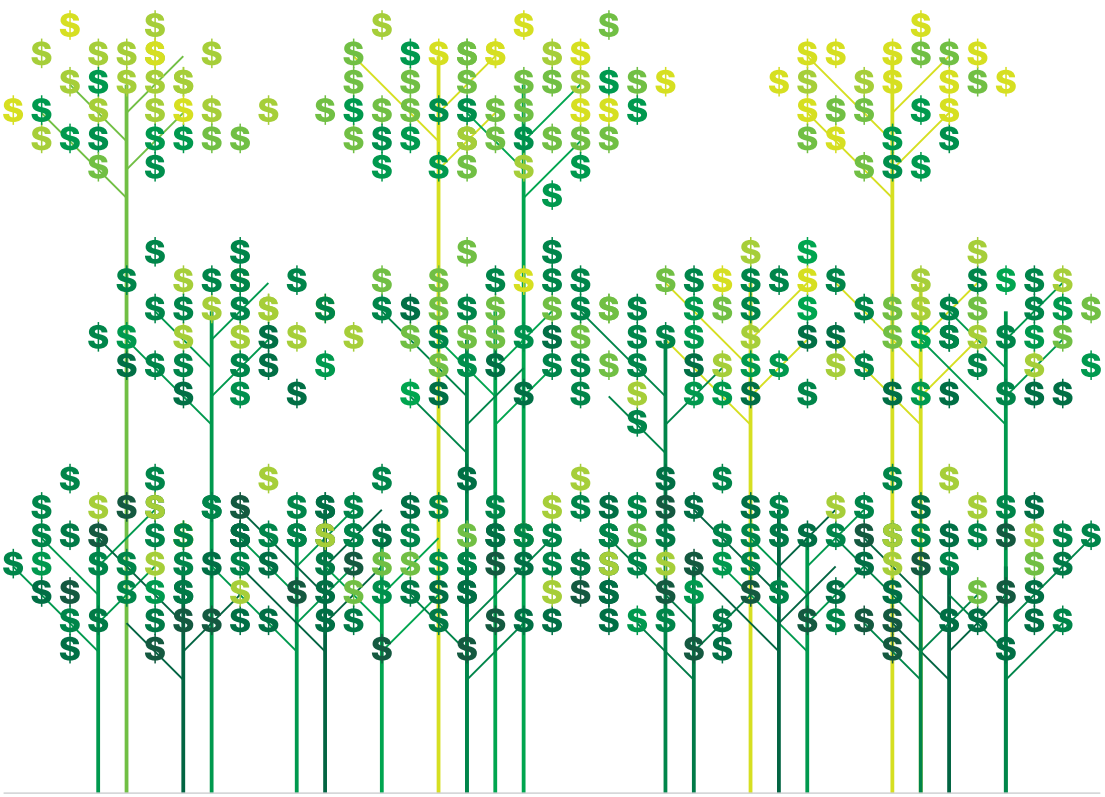
What type of action agenda emerges for business, investors, governments and public sector agencies in the century's second decade? These are questions we will be addressing through 2010, but some early pointers are offered below.

We hope that this brief paper will contribute to the buzz surrounding the UN's International Year of Biodiversity and the publication of the TEEB report, helping link these emerging agendas to top-level decision-making and policy formulation spaces. Let's briefly address the business, financial and government agendas.

1
The Business Agenda

2
The Financial Markets Agenda

3
The Government Agenda



1 The Business Agenda

Business engagement and investment will be crucial in driving the Biosphere Economy forward—and it is very encouraging to see organizations like B4E, WBCSD and WEF getting involved. But to move to the next stage, the agenda has to move from the portfolios of the likes of Chief Sustainability Officers to the desks of the Chairman and CEOs, Chief Financial Officers, Chief Investment Officers and Chief Business Development Officers.

So, first, here are some starting points for C-Suite discussion:

1 **Build the business case for natural capitalism** We have seen that a small number of CEOs are beginning to take bold leadership, embracing a natural capital agenda as a core part of future-proofing the company's reputation and competitive position. Growing numbers of leading companies will build biosphere, biodiversity and footprinting coverage into their annual reports, explaining the links to value creation and risk management.

2 **Recognize that footprinting will be as urgent a challenge as TQM** Total Quality Management crept up on many companies—and the footprinting agenda will do likewise. Yes, there's money to be made from reducing your ecological footprint, but this will be an innovation story, too. Explore the creation of 'zero footprint' products, processes and supply chains. Work with your most demanding customers on this—think of the ambition stories of Wal-Mart or Marks & Spencer.

3 **Develop new partnerships** Integrate nature's principles into the heart of your design processes, including cradle-to-cradle models. Work with the likes of the Global Footprint Network (GFN) on the latest generation of tools—and with Janine Benyus' Biomimicry Institute to advance the wider bio-innovation agenda. Help these pioneers engage other parts of business—and the leading edge of the financial world.

4 **Bring financial executives into the game** Introduce natural assets as a key area of value across the C-Suite agenda. Map and understand your company's critical dependencies on ecosystem services—and the early actions that can be taken to create a better balance between your business and nature. Again, pick high-powered partners, such as GFN, the Natural Capital Project, the World Resources Institute, the World Business Council for Sustainable Development, TEEB (the Economics of Biodiversity and Ecosystems) project team, or WWF.

5 **Build new political platforms** Help form a 'Global Business Alliance for the Biosphere', tackling sector- and industry-wide opportunity areas, among other things advancing the convergence of footprint standards and regulation. Develop new links with mainstream business networks, institutional investors and international public agencies, working alongside innovators to create momentum for government action and improved governance of the biosphere.

"We are helping leading corporations to think about the significance of planetary limits for their business success. We use our metrics to ask what do planetary limits mean for the business case? What kind of markets will vanish and which will open up?"

Mathis Wackernagel

President, Global Footprint Network

2 The Financial Markets Agenda

With some honorable exceptions, investors have been slow in tackling the climate change challenge, though experiments in areas like carbon trading have begun to take off. And it is interesting to see key organizations like the Carbon Disclosure Project (CDP) extending their remit—and, in consequence, the financial markets agenda—from carbon to water. The inputs of financial institutions and analysts will be critical, but the likelihood is that progress will continue to be patchy and interrupted—which is why clear, effective and sustained government action will also be crucial.

Here are some recommendations for discussion among investors and those who advise them:

1 **Explore how Biosphere Economy initiatives create shareholder value** As a company and as an industry, work to advance understanding of the financial potential of ecosystem services. Join with initiatives like the Natural Value Initiative, already supported by the UNEP Finance Initiative, to generate stronger links between economic shareholder value and the wider worlds of biodiversity and ecosystem services.

2 **Develop and promote 'Natural Assets 101' courses and content** Partner with business schools, universities and other centers of excellence to improve shared—and peer-reviewed—knowledge of how investors can best create long-term value by incorporating natural assets into their analyses and portfolios, both as an asset class (e.g. sustainably managed forests) and as a valuation factor in equity and other investments.

3 **Identify key road-blocks—and work to remove them** Help develop and support tailored discussions with institutional investors on the actions that must now be taken, the roles they can play and the models they can adopt and adapt. Recognize that early stage experiments should be voluntary, which encourages creativity and innovation, but be willing to back regulatory and other political action when the time comes.

4 **Engage long-term investors** The work of Earth Capital Partners with their 'Earth Dividend' metric and of the P8 Group with pension funds illustrate how leadership can help drive progress. Where mandatory regulation is required, and based on a better understanding of the links between shareholder value and natural assets, initiate dialogues with governments, economic policy-makers and other key stakeholders on the types of regulatory measures that will accelerate change across the financial community.

5 **Experiment with new risk—and opportunity—models** Work to advance new thinking on risk models that more effectively incorporate natural assets. And increase the quantity and quality of cases that analyze how the economic valuation of natural assets can help investors build and improve their long-term investment portfolios.

6 **Join the debate** In Dante's Inferno, the deepest, hottest parts of Hell were reserved for those who did nothing. Get involved—and if you haven't got the time, ensure that other key people in your organization engage and report back.

The Government Agenda

The 'tragedy of the commons'[45] originally played out locally, with shepherds overloading grazing land, or foresters or slash-and-burn farmers unwittingly destroying the forests their livelihoods depended on. Today, the same dynamic is playing out on a world scale, with the decline of the biosphere. Many national governments remain ineffective, and in some cases corrupt, but their role has to be increasingly central. Global governance institutions and mechanisms remain weak, and in some cases are conspicuously failing, as illustrated by some of the COP15 outcomes. But extraordinary times often call forth extraordinary leaders—and new forms of leadership that would have been unimaginable in less troubled times.

So, third, here are some issues that governments, policy-makers and regulators should be considering as a matter of urgency:

1 **Steward national natural capital** Take early steps towards the reshaping and eventual regulation of financial markets and business, based on their role as stewards of 'national natural capital'. Build on the experience and indicators developed by the likes of the Natural Value Initiative, the Carbon Disclosure Project and the Forest Footprint Disclosure. Help move the agenda from issue-based management (i.e. carbon, water, forests) to fit-for-purpose incentives and indicator sets that drive systemic, effective, sustainable management of critical natural assets.

2 **Launch local, national and regional TEEBs** Understand and project the future trajectories of your country's ecological assets—and invest in quantifying the value of the services provided to the economy. Actively engage with and build on the work of the Global Footprint Network and the TEEB (Economics of Biodiversity and Ecosystems) project team.

3 **Integrate the status and health of natural assets into GDP** Upgrade national accounts and the accounting processes used, to integrate the value of natural assets and test the true opportunity costs and benefits of alternative national development policies.

4 **Tax and subsidize** Adjust taxes and subsidies to strengthen—rather than weaken, as is often the case with fisheries and other open access resources —the country's natural assets. Remove subsidies on biosphere-damaging activities and reallocate them to areas and sectors that help build tomorrow's Biosphere Economy.

5 **Ramp up investment** None—or very little of this—can be done without funding. Invest in ecological infrastructures in the same way that governments invest in water, energy or transport infrastructures. Recognize that the next decade will see growing attention paid to natural infrastructures, just as Hurricane Katrina focused US attention on the stupefying impact of the removal or degradation of wetlands in the Mississippi Delta.

Get out ahead of the game, rather than waiting for the future to come crashing in. True leadership involves creating the future, rather than having it happen to you. Timing is also a critically important element in successful leadership—and the evidence increasingly suggests that the time is ripe for totally new business opportunities and markets to be spawned by the race to map, value and invest in tomorrow's vital ecosystem services.

"I'm excited to use ecosystem markets to divert capital flows away from short term, unproductive and environmentally destructive activities. Investors are switching on to this agenda as they are beginning to understand the genuine long-term environmental benefits and liabilities associated with their capital allocation decisions."

Jason Scott

Founding Partner, EKO Asset Management Partners

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