CORPORATE CAMEO CASES: ECOSYSTEM SERVICES, BIODIVERSITY AND BUSINESS

Peter Jones and Daphne Comfort

Abstract

Ecosystem services and biodiversity are normally associated with the environmental sciences, but they also underpin a wide range of business activities. At the same time, there are also concerns that many companies ignore the damaging impact their operations can, and do, have on ecosystem services and biodiversity. This paper outlines some of the features of ecosystem services and biodiversity, provides four cameo cases of how three major companies, namely Unilever, Nestlé and Dow Chemical Company, and one joint international association, PIECA and IOGP, are publicly communicating their approaches to ecosystem services and biodiversity and offers some concluding reflections on two sets of the wider issues, namely shared value and equity and measurement and valuation

Introduction

While ecosystem services and biodiversity are normally associated with the environmental sciences, they also underpin a wide range of business activities. The formal concept of ecosystem services, simply defined as the contribution of natural systems to human wellbeing emerged in the 1970's, but businesses have been increasingly using land and natural resources as productive assets over many centuries. While recent years have seen growing awareness that many businesses rely on ecosystem services, there is a paradox here in that *'healthy ecosystems form the basis for numerous business operations'* yet *'many companies contribute to the degradation of ecosystem services via the same business operations which depend on the ecosystem's health'* (Natural Capital Coalition 2017). In a similar vein, there is widespread recognition that the concept of biodiversity, which began to be widely adopted in the 1980s and can be simply defined as, the variety of plant and animal life, *'is fundamental to long term business survival,* there is growing recognition that *business and industry can have major negative impacts on biodiversity resources'* (International Finance Corporation 2020). That said, there are concerns that many companies ignore the impact of their operations on ecosystem services and biodiversity. With these thoughts in mind, this paper outlines some of the features of ecosystem services and biodiversity, provides some simple case studies of how three major companies, namely Unilever, Nestlé and Dow Chemical Company, and one joint international association, PIECA and IOGP are publicly communicating their approaches to ecosystem services and biodiversity and offers some concluding reflections on two sets of the wider issues, namely shared value and equity and measurement and valuation.

Ecosystem Services and Biodiversity

Danley and Widmark (2016) claimed that ecosystem services is a phrase with many meanings. The United Nations Millennium Ecosystem Assessment (2005) succinctly defined ecosystem services as *'the benefits people obtain from ecosystems'* while for Fisher et al. (2007) *'ecosystem services are the aspects of ecosystems utilized (actively or passively) to produce human well-being.'* More extensively, for the UK National Ecosystem Assessment (2020) *'ecosystem services are the benefits provided by ecosystems that contribute to making human life both possible and worth living.'* Further, the UK National Ecosystem Assessment (2020) asserts that *'examples of ecosystem services include products such as*

food and water, regulation of floods, soil erosion and disease outbreaks, and non-material benefits such as recreational and spiritual benefits in natural areas' and that *the term services is usually used to encompass the tangible and intangible benefits that humans obtain from ecosystems, which are sometimes separated into goods and services.'*

A number of types of ecosystem services have been recognised. The European Environment Agency (2019), for example, identified three categories of ecosystem services namely: provisioning services, maintenance and regulating services, and cultural services. Provisioning services are the tangible products that people obtain from ecosystems, they are vital for the economy, include biomass, water and fibre, energy and many have well developed markets and valuation systems. Maintenance and regulating services embrace the ways ecosystems control or modify the environment. They are not consumed as such, but they affect the activities of people and businesses and they include includes soil formation and composition, pest and disease control and climate regulation. Cultural services are the more intangible benefits people derive from the natural world, they embrace the significance of nature within people's culture and include recreation, spiritual and intellectual sustenance and a sense of place.

While there is no universally agree definition of biodiversity the term is generally taken to refer to the variety and variability of life on Earth and is typically seen as a measure of variation at the genetic, species, and ecosystem level. The Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (2019), for example, simply refereed to biodiversity as *'the diversity within species, between species and of ecosystems.'* Swingland (2013) define biodiversity as *'species, genetic, and ecosystem diversity in an area, sometimes including associated abiotic components such as landscape features, drainage systems, and climate*.' For the United Nations Convention on Biological Diversity (1992) biodiversity is *'the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.'* More commercially, the Cambridge University for Sustainability Leadership (2019) suggested that *'biodiversity fundamentally underpins the benefits that businesses derive from natural capital and supports the key ecosystem functions that ensure the delivery of business operations and productivity.'*

While ecosystem services and biodiversity are often seen as separate concepts, there an important relationship between them. This relationship has been described as *'multilayered'* by Mace et al. (2012) in that *'biodiversity combines with the concept of ecosystem services at all levels: it provides the support to key processes, it directly affects the delivery of some ecosystem services and it may itself be the good that is valued.'* In a wide ranging literature review, Harrison et al. (2014), explored some of the linkages between biodiversity and ecosystem services and reported that while the links were highly complex and service dependent, the majority of them were positive. Here, *'species level traits were found to benefit a number of ecosystem services, with species abundance being particularly important for pest regulation, pollination and recreation, and species richness for timber production and freshwater fishing'* (Harrison et al 2014). In a similar vein, Harrison et al. (2014) suggested that *'the services of water quality regulation, water flow regulation, mass flow regulation and landscape aesthetics were improved by increases in community and habitat area.'*

During the last decade there has been growing corporate awareness of the importance of ecosystem services and biodiversity in providing and maintaining the goods and services that support businesses and economic growth. Almost a decade ago, the International Geosphere-Biosphere Programme (2012) suggested that *'current trends in biodiversity and ecosystem services are sharply and dangerously negative'* and such concerns have led to increasing corporate recognition of the fragility of ecosystem services and biodiversity. This, in part, is reflected in the growth of corporate sustainability programmes. Here, the majority of leading global corporations have developed wide ranging sustainability and corporate social responsibility strategies designed to publicly report on their environmental, social and governance commitments.

In highlighting *'our sustainability ambition',* AstraZeneca (2019a), for example, claimed *'how we operate supports sustainable ecosystems for healthcare that benefit 'environmental protection'* its 2019 Sustainability Report, AstraZeneca (2019b) recognised that *'global society is depleting some of the Earth's natural capital'*, that *'the planet's life-supporting systems and the condition for life are under threat',* and that *'the time to act is now.'* In its 2019 Sustainability Report BP (2020) stressed that the company looked to *'work in ways that result in no accidents, no harm to people, and no damage to the environment, including no net loss to biodiversity when undertaking new projects in sensitive areas.'* and that it was *'working to develop industry good-practice guidance in line with the launch of the new post-2020 global biodiversity framework.'* More specifically, a number of companies and corporate associations have publicly reported on their approach to ecosystem services and biodiversity and the following four cameo case studies provide some insights into these approaches.

Unilever is a British-Dutch transnational consumer goods company, it owns over 40 brands, its product range includes food, beverages, cleaning agents and beauty and personal care products, which are on sale in almost 200 countries and it employs 155,000 people. Nestlé is a Swiss based multinational food and beverages processing company, it has over 2,000 brands, which are available in over 180 countries and it employs some 350, 000 people. Dow Chemical corporation is an American based multinational corporation, its products include plastics, chemicals and agricultural products, it has operations in over 150 countries and it employs 54,000 people. IPIECA is a global not for profit oil and gas industry association for environmental and social issues and IOPG is the international association of oil and gas producers.

Unilever

In looking to explain *'why businesses are getting behind the biodiversity agenda'* Unilever (2019) recognised *'the health of our planet has reached a dangerous tipping point, with a massive loss of nature and biodiversity putting economies at risk and threatening the livelihoods of millions of people.'* More specifically Unilever (2020) reported on biodiversity and its relationship with its suppliers and emphasised that part of the value of its brands is the assurance the company gives its customers on the quality and safety of its products. The company argued that its reputation is built on care for people and the environment throughout the supply chain. Here, farmers often play an important role and they, depend *on the 'ecosystem services' provided by pollinators, predators, the organisms*

that build soil fertility and the forests and riparian strips of native vegetation that help maintain rainfall and water flow in rivers, and reduce flooding' (Unilever 2020).

Unilever suggested that farmers traditionally saw themselves as producers with limited concern for wildlife, biodiversity or nature conservation, but that there is a growing awareness that farmland provides important resources and habitats for migrating birds and insects, that bees act as pollinators and raptors as pest-controllers, that wetlands and riparian areas serve as pollution-filters preventing toxic or polluting substances, arising from farm practices, entering rivers and water supplies. At the same time the company suggested that the underlying genetic diversity, that plant and animal breeders harness, to improve yield and quality, enhance pest and disease resistance, and extend the growing season.

That said, Unilever explicitly recognised biodiversity priorities for farmland are very different in different parts of the world and provided some examples to illustrate this variety. The Parque Nacional de Donana, west of Seville in Southern Spain, is an important wetland nature reserves and is also one of Europe's major areas of strawberry production. The cultivation of strawberries is dependent on irrigation and the farmers are effectively in competition with the nature reserve for water resources and Unilever have been involved in the search for a strategy that attempts to reconcile the competing interests. This has involved detailed recording of the annual pattern of water use to optimise its efficiency, and while there have been local political problems, best practice guidelines are now available for farmers.

In the Eastern Arc Mountains of South West Tanzania, the Mufindi Forest stands high above over 300 small tea gardens that make up the Lipton's Tea Estate. Although some forest clearing has taken place in the past, the remaining forested area provides an important habitat for a number of rare, and some unique, species of animals and plants and is considered to be a valuable biodiversity hot spot. There is an important relationship between the upland forest and the lower tea estate in that he forest helps to minimise erosion on the slopes which run down to the tea estate and to maintain the microclimate and the water supply needed by the crop and during the dry season the estate is irrigated using harvested rainwater. Liptons have partnered with the Tanzanian Forest Conservation Group on conservation projects and new tree planting, and to recognise, and assess, forest disturbance and more generally to develop awareness of ecology. The overall focus is to support the development of local communities and to reduce the pressure on the forest to help to maintain the relationship between the natural environment and commercial agriculture.

Steinicke, based in Wendland, is one of Germany's leading producers of herbs and dried vegetables and supplies Unilever with chives, parsley, carrots, celeriac and leeks. The Wendland area of Lower Saxony is relatively sparsely populated and provides seasonal habitats for a range of migratory birds and for a number of endangered species including otter, beaver and common crane. The farmers who supply Steinicke have looked to modify their cultivation methods to accommodate the wildlife and conservation interests by not growing produce on wetlands, by mowing meadows just once each year, planting hedges, and providing nesting boxes and bird hides. Frigamo is the largest supplier of frozen and dried potatoes in Switzerland and all the farmers that supply Unilever are around the small town of Creasier in Neuchatel. Here farmers have established important habitats for storks,

swallows and wild bees, by maintaining fallow land, hedges, fruit trees and flower stripes and have also modified their cultivation practices to take into account the breeding times of birds.

Nestlé

Nestlé outlined its approach to biodiversity and ecosystem services as part of its commitment to natural capital. As such, Nestlé (2020a) described natural capital as *'the sum total of nature's resources and services, and the basis upon which economic activity is built'* and identified biodiversity and ecosystem services, along with inert resources, such as fossil fuels, as the three constituent elements of natural capital. The company emphasised that its long term success is dependent upon the products and services provided by natural capital. Nestlé, is a large user of agricultural products and acknowledged that many agricultural practices can make a major contribution to the loss of natural capital through the conversion of forests, grassland and wetlands, heavy reliance on chemical fertilisers and pesticides, water extraction and soil erosion and degradation. In addition, Nestlé uses seafood from the oceans and across the world it operates from over 460 factories, some of which are in areas that exhibit high levels of biodiversity. Further, the company argued that its rural factories have a role to play, as protecting and enhancing natural capital is an essential element of strengthening rural development.

Nestlé is committed to develop its business in a way that safeguards natural capital, and in particular biodiversity and ecosystem services. More specifically, the company claimed that this commitment is embedded into it's corporate business principles, its supplier code, and its commitments to sustainable sourcing for forest based materials and water use in agriculture. More specifically, Nestlé (2020a) made four sets of commitments, namely to *'act as a responsible steward of natural capital'*; *'report on risks and responses'*; *'support consumers to make better-informed choices'*; and *'work with stakeholders.'* In acting as a responsible steward, for example. the company looked to ensure that its operations maintain or enhance high conservation values in areas where its operations are located in or dependent on, and that it provides guidance to farmers on sustainable agricultural practices designed to manage and conserve water and soil, to conserve and restore biodiversity, and to reduce discharges and wastage. In supporting consumers to name more informed choices, one focus is on engaging with local communities on projects to enhance biodiversity values, as part of the company's community engagement strategy.

The company has reported on its delivery of a number of its commitments to biodiversity and ecosystem services in its 2019 *'Progress Report'* on *'Creating Shared Value'* (Nestlé 2013). In outlining its actions on climate change, for example, while the company reported on its headline goal to achieve net zero greenhouse gas emissions by 2050, it also emphasised that developing agricultural initiatives for carbon storage, reforestation and biodiversity protection, were vital elements in meeting this goal. In its goal to safeguard the environment the company stressed its commitment to protect natural resources and biodiversity and to minimise its environmental impact. The company also reported on working with industry partners to address biodiversity loss and to achieve deforestation-free supply chains. More generally, Nestlé reported on its determination *to demonstrate leadership in biodiversity protection and on its plans to accelerate transformational change in food and agriculture systems to protect biodiversity for the benefit of people and planet*

alike' (Nestlé 2020a). Biodiversity is one of the 4 categories listed under the heading of environmental sustainability in Nestlé schedule of Key Performance Indicators in its progress report on shared value. Here the indicator was the total size of manufacturing plants located in protected areas, and while the data was published for 2018, the company has discontinued publishing the information because it was no longer seen as a materially important way to communicate the company's dependency and impact on biodiversity.

Dow Chemical Company

In addressing *'Valuing Ecosystems',* the Dow Chemical Company (2015) emphasised that it *'appreciates nature for its intrinsic value and also recognizes its dependency on the critical services nature provides*.' The company argued that while *'ecosystem services are too frequently taken for granted, nature provides a variety of valuable services to individuals, communities and businesses'* (Dow Chemical Company 2015). While the company acknowledged that the benefits of ecosystem services are complex, it also reported its commitment to *'incorporating their value into business decisions'* (Dow Chemical Company 2015). More specifically the Dow Chemical Company reported on a number of initiatives designed to incorporate the value of nature into its operations.

In the mid 1990s at the company's Seadrift Operations site in Texas was looking to expand its water treatment capacity but decided to adopt a natural technology approach rather than to build a conventional wastewater treatment plant. The company's approach was to construct a wetland designed to treat wastewater in a natural setting. Further the company reported that it would save an estimated $282 million in present net value over the expected lifetime of the facility. In an attempt to encourage the more widespread introduction the company undertook an analysis to compare the economic and environmental impact of the two options, which suggested that the lower energy and material inputs to the wetland treatment facility resulted in lower potential impacts for fossil fuels and ozone depletion and were likely to lead to lower potential impact for global warming and marine eutrophication. More generally, the company claimed their analysis gave a lie to the conventional wisdom that green infrastructure always requires a greater land area its physical counterpart.

In a joint initiative with The Nature Conservancy, a global environmental non-profit organisation, the Dow Chemical Company launched an initiative designed to incorporate the value of nature into business decisions, and more particularly to develop and apply methods to evaluate the benefits from nature, and to create a strategic way for companies to assess, incorporate and to invest in nature. The first of two pilot schemes at Freeport in Texas, US, focused on three ecosystem services, namely improving air quality through reforestation, mitigating coastal hazards with natural infrastructure, and preventing disruption to freshwater supply. Here the company reported that he most promising results suggested that large scale reforestation could improve air quality. The second pilot scheme at Santa Vitoria in Brazil, looked to expand agricultural production, while minimising the environmental impact and maximising ecosystem services, while also complying with the country's Forest Code, which was designed to protect rivers, soils and forests on privately owned land. This pilot scheme identified areas best for promoting biodiversity or preserving water quality.

The joint initiative also included a number of other projects. An *'Ecosystem Services Identification and Inventory'* (Dow Chemical Company 2015) tool was developed to provide rapid assessment of ecosystem services at a site level, and the aim here was to enable businesses to rapidly identify, characterise ecosystem services and to estimate their value, to businesses, and the public, from the land on, or adjacent to, their sites. In a similar vein, the *'Biodiversity and Ecosystem Services Trends and Conditions Assessment Tool* '(Dow Chemical Company 2015) provides businesses with open access to global data and a user interface that enables them to measure, compare and prioritise current, and future asset portfolios in terms of biodiversity and ecosystem services.

More generally, the Dow Chemical Company claimed a strong philanthropic tradition of supporting nature conservation. At the company's Riverside site, at Peverly, Missouri, US, for example, the company reported a strong commitment of support for habitat preservation and water conservation and at Pittsburg, California, US, the company has supported the improvement and upkeep of an important area of wetland. Here, the Dow Wetlands Preserve, an area of 188 hectares, includes 70 hectares of freshwater and brackish tidal marsh, as well as a beaver pond, freshwater ponds, open wates, mudflats, riparian zones and grassland. The wetland provides a habitat for a variety of endangered animal and plant species including the salt marsh harvest mouse, the black shouldered kite and the northern harrier.

Oil and Gas Industry Associations

IPIECA, the global oil and gas for advancing environmental and social performance and IOGP, the international association of oil and gas producers, have produced a guidance document on *'Biodiversity and Ecosystem fundamentals'* (IPIECA and IOGP 2016). The guidance looks to link strategic development on biodiversity and ecological services and decision making at the corporate level and sets out a framework of six management practices. These practices cover building biodiversity and ecosystem services into governance and business processes; engage with stakeholders and understanding their expectations; understanding baselines; assessing dependencies and impacts; mitigating and managing the impacts and opportunities; and selecting, measuring and reporting on performance indicators.

By way of introduction, the two associations emphasised the widespread recognition of effective biodiversity and ecosystem services performance within the oil and gas industry. More specifically the associations suggested that biodiversity and ecosystem services can be vitally important in meeting stakeholder expectations, avoiding costly design and project delays, maintaining licence to operate and in generating new business opportunities. The guidance recognises that oil and gas exploration, development and production can impact on the biodiversity and natural resources on which local communities depend and that the industry's operations may also depend on ecosystem services provided by the natural environment such as freshwater supply or coastal storm surge protection. These dependencies and the need to manage risk are seen to be important factors both at appropriate spatial scales and across the life cycle of industry assets. The two associations offer guidance at six stages of the asset lifecycle and two of them are illustrated here, namely engaging stakeholders and managing impacts and opportunities.

Stakeholder engagement is seen as an ongoing opportunity through which companies communicate with, learn from, and respond to, their stakeholders and it enhances the companies' understanding of stakeholders' expectations about biodiversity and ecosystem services, and provides a forum for communicating company performance. Further, engagement with stakeholders is seen to be important in helping to understand how local communities value and use natural resources, such as fishing grounds, and water resources, on which a company's operations may depend and how a company's operations may affect the quantity, and quality of, and access to such resources. The two associations referenced more detailed guidance by project phase and habitat type and also outlined how stakeholder engagement can be used to supplement and ground truth information from desk top studies on the provisioning, regulating and cultural dimensions of ecosystem services.

The importance of stakeholder engagement is illustrated with reference to Exxon Mobil's work in piloting improved communications on Alaska's North Slope. Here subsistence whaling is arguably the most important and culturally significant activity for the indigenous communities and whaling can occur in close proximity to the marine activities undertaken by the oil and gas industry and by large ocean cruising ships. Exxon Mobil, along with other oil and gas companies has voluntarily participated in an annual conflict avoidance agreement with indigenous whaling communities, which outlined protocols, for example, on the timing, location and speed of vessels, and which also funded dedicated communication centres, which used very high frequency radio to communicate with industry vessels, whaling crews and coastal stations.

The management and mitigation of impacts and their related risks is seen to be central in reducing biodiversity and ecosystem risks to projects and operations within the oil and gas industry and can also identify opportunities to improve biodiversity and ecosystem services through restoration and enhancement activities. The guidance document emphasized that *'the mitigation hierarchy is a central approach to managing biodiversity and ecosystem services'* for a variety of reasons. It is seen, for example, to reduce ecological, economic, regulatory and reputational risks and costs, to facilitate the early identification of risk management options and additional conservation actions, and as an organising framework, it can provide a simple central planning reference, a platform to engage stakeholders and a stimulus for performance measurement. Ultimately, the goal of the mitigation hierarchy is seen to be protect biodiversity and ecosystem services and the guidance document identified two acceptable scenarios in any development namely *'no net loss'* and *'net gain'* (IPIECA and IOGP 2016). In the former, there should be no overall reduction in either the diversity within, or among, species and ecosystems, or in their ability to deliver valued ecosystem services. In the latter, the focus is on leaving an overall positive legacy. That said, exactly how such targets should be measured and monitored is a matter of ongoing debate within the industry.

The two associations illustrated the industry's approach to the management and mitigation of biodiversity and ecosystem services with reference to PERU LNG. Here the company faced the challenges of managing a wide range of sensitive biodiversity and ecosystem services across very varied physical environments, including the upper montane forests of the Amazon headwaters, the Andes, and the Peruvian desert, for a natural gas pipeline, which ran to a liquefaction plant on the shores of the Pacific Ocean. The company

developed an approach to biodiversity and ecosystem services which reflected the diversity of the landscapes and topography along the pipeline's route. The company claimed that their approach allowed it to manage biodiversity and ecosystem services at meaningful scales, with actions that were seen to be in harmony with the ecology and geography of the varied landscapes.

Concluding Reflections

The four cameo case studies provide a variety of illustrations of the approaches to ecosystem services and biodiversity in the corporate world. On the one hand, the cameo case studies reveal corporate recognition that ecosystem services and biodiversity underpin many business operations and that they are essential to long term business survival and, arguably more contentiously, to continuing growth. On the other hand, there was also an awareness of the potentially damaging impact businesses can have on ecosystem services and biodiversity and many of the conservation activities pursued by companies can be interpreted as acknowledgement of the need to mitigate and manage such impacts. At the same time, many of the ecosystem services and biodiversity projects outlined in the cameo case studies brough operational and financial benefits to the companies that pursued them. More widely, the majority of large businesses have developed sustainability and corporate responsibility strategies which outline their general commitment to the environment, and here there are often specific commitments to biodiversity and to preserving the natural integrity of ecosystems. That said, two wider, and partly interlinked sets of issues, namely shared value and equity, and the measurement and valuation merit reflection and discussion.

Firstly, Schröter et al. (2014) argued that while the concept of ecosystem services *'has gained considerable interest inside and outside of science, it is increasingly* contested', and that it *'promotes an exploitative human–nature relationship.'* On the one hand, in many ways the cameo case studies reflect the concept of shared value. The concept of shared value was defined by Porter and Kramer (2011) as *'corporate policies and practices that enhance the competitiveness of the company while simultaneously advancing social and economic conditions in the communities in which it sells and operates.'* Indeed, Nestlé (2020b), one of the companies featured in the cameo cases, claimed that *'creating shared value is fundamental to how we do business.'*

While this suggests a win-win situation, there are counter arguments. Crane et al. (2014), for example, identified a number of weaknesses and shortcomings in the shared value model. More specifically, they argued that the model is *'naïve about the challenges of business compliance'*, and that *'many corporate decisions related to social and environmental problems, however creative the decision maker may be, do not present themselves as potential win-wins, but rather manifest themselves in terms of dilemmas.'* Further Crane et al. (2014) suggested that such dilemmas are effectively *'continuous struggles between corporations and their stakeholders over limited resources and recognition.'*

These contrasting positions are also linked to the issue of equity, which ideally should embrace processes to allow the participation of all stakeholders in decision making and the sharing of benefits amongst all stakeholders. Here the development of ecosystem services may be seen to disadvantage certain groups and this may be a particular problem,

in less developed countries, when, vulnerable groups are not genuinely engaged in decision making over a scheme which requires indigenous communities to change their land use location or method of cultivation. That said, such concerns are not confined to the less developed world and in focusing on social equity and ecosystem services in England, Mullin et al. (2017), for example, argued that *'where landscape change or management intervention reveals likely change in ecosystem service provision, the social groups that are winners or losers should be identified.'*

Secondly there are the thorny issues of measurement and valuation. Reyers et al. (2013), for example, claimed that despite growing interest in ecosystem services, *'it remains unclear how ecosystem services – and particularly changes in those services – should be measured'* not least because, *'the social and ecological factors, and their interactions, that create and alter ecosystem services are inherently complex.'* In a similar vein, there are major problems in looking to measure biodiversity, not least in that it is a complex concept which cannot be fully captured in numerical terms, or in ways that can be understood by all stakeholders or meaningfully employed by policy makers.

In many ways, looking quantify the value of ecosystem services is an even thornier, and fiercely contested, issue. In drawing attention to the increasing interest in the economic valuation of ecosystem services and biodiversity, Atkinson et al. (2012) recognised that the *'growing recognition that the benefits and opportunity costs associated with such services are frequently given cursory consideration in policy analyses or even completely ignored'* and that *'the valuation of biodiversity and ecosystem services is therefore increasingly seen as a crucial element of robust decision making.'* However, a number of arguments have been mounted against the valuation of ecological systems. There are arguments, for example, that putting a monetary value on biodiversity implies that it can divided up into smaller parts and about the difficulties of valuing an asset when its true value is as part of a coherent whole. At the same time there are concerns that different stakeholders may view the price of ecosystem services and biodiversity very differently and that putting a widely agreed price on cultural ecosystem services, such as spiritual sustenance and a sense of place, may be an elusive task.

There are also concerns that the economic valuation of ecosystem services and biodiversity is *'likely to pave the way for the commodification of ecosystem services with potentially counterproductive effects for biodiversity conservation and equity of access to ecosystem services benefits'* (Gomez-Baggethun and Perez 2011). More politically Robertson (2011) claimed that *'the development of markets in water quality, biodiversity and carbon sequestration signals a new intensification and financialisation in the encounter between nature and late capitalism.'* Further, Robertson (2011) argued that *'the commodification of such ecosystem services 'is not merely an expansion of capital toward the acquisition or industrialisation of new resources, but the making of a new social world comparable to the transformation by which individual human labours became social labour under capitalism.'*

Finally, and by way of a more balanced conclusion, businesses will argue that they have to make decisions about the natural environment, ecosystem services and biodiversity as an integral part of their business activities and those decisions will often involve making difficult choices and in so doing they will draw on economics in examining how to utilise natural resources that have alternative uses. At the same time, those environmentalists who

see *'natural capital as primary and sacrosanct'* (Read and Scott Catto 2014), will rail against framing ecosystem services and biodiversity in financial and economic terms. Well over a century later, and in a rather different context, the words of Oscar Wilde (1891), *'nowadays people know the price of everything and the value of nothing'* still seem to resonate.

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THE AUTHORS

Peter Jones and Daphne Comfort work in the School of Business at the University of Gloucestershire