Business and biodiversity loss, conservation, and restoration

Key terms from chapter solicitation

* Biodiversity
* Physical environment
* Ability of corporations to respond to challenges in their physical environment
  + Scopes framework
  + Competitive restrictions
* Ecosystem stability
* Human well-being
* Economic prosperity
* Business activities / operations
* Ecosystem services
* Biodiversity conservation
* Risk mitigation
* Resilience
* Global sustainability goals
* Field of business in society
* Past and present relevance of biodiversity for the field of business in society
* Destroying an ecosystem if another ecosystem is created (offset)
* Ratio versus absolute outcomes
  + Carbon/water intensity versus carbon emissions or water withdrawal

Wall Street Journal coverage

* <https://www.wsj.com/articles/half-a-year-after-the-cop-agreement-on-nature-companies-are-increasingly-looking-at-their-biodiversity-impact-d0b53fb3>
* <https://www.wsj.com/articles/gucci-owner-kering-drugmaker-gsk-and-others-are-developing-a-global-standard-on-nature-loss-4c2a7f3b>
* <https://www.wsj.com/articles/quantifying-companies-impact-on-forests-oceans-is-a-challenge-11647349201>

# What is biodiversity

1. This chapter describes how business depends on and impacts the biological diversity or “biodiversity” of nature. Biodiversity is defined as “the variability among living organisms from all sources including…the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems” (Secretariat of the Convention on Biological Diversity, 1992, p. 4). Corporations and other businesses depend on and impact biodiversity. Global sustainability goals seek to preserve existing and restore lost biodiversity, and companies face an increasing expectation to use ecosystems and species “in a way and at a rate that does not lead to the long-term decline of biodiversity” (Secretariat of the Convention on Biological Diversity, 1992, p. 5).
2. In 2022, more than 200 nations established the Kunming-Montreal Global Biodiversity Framework laying out a plan for the world to live in harmony with nature. Target 15 directly notes the roles and responsibilities of businesses in achieving societies compatible with biodiversity conservation and restoration. “Take legal, administrative or policy measures to encourage and enable business, and in particular to ensure that large and transnational companies and financial institutions: (a) Regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity, including with requirements for all large as well as transnational companies and financial institutions along their operations, supply and value chains, and portfolios; (b) Provide information needed to consumers to promote sustainable consumption patterns; (c) Report on compliance with access and benefit-sharing regulations and measures, as applicable; in order to progressively reduce negative impacts on biodiversity, increase positive impacts, reduce biodiversity-related risks to business and financial institutions, and promote actions to ensure sustainable patterns of production” (CBD, 2022, p. 11).
3. Biodiversity is important for both utilitarian and cultural reasons. The sustainable use of biodiversity allows us to meet present human needs while preserving options for future people to meet their own needs, in line with the concept of sustainable development (UNWCED, 1987). The most basic need met by biodiversity is the need for natural resources produced by ecosystems. An ecosystem is "a dynamic complex of plant, animal, and micro-organism communities and their nonliving environment interacting as a functional unit" (United Nations, 1992, p. 3). Common ecosystem units include forests, wetlands, and estuaries. Materials produced by ecosystems and useful for people are natural resources. Natural resources include both living and nonliving materials. Biodiversity is relevant to living materials, such as timber, edible plants and animals, and fibers. Meeting present shelter, food, and clothing needs requires sustainable sources of such natural resources. Ecosystem produce natural resources, and meeting present and future needs requires sustaining ecosystem function to produce and reproduce resources. The same argument applies to immaterial benefits derived from ecosystems, which have been named ecosystem services to distinguish them from material natural resources. Some ecosystem services derived from biodiversity include waste disposal, water purification, climate regulation, recreation, cultural value, religious meaning, inspiration, flood mitigation, and protection from natural disasters (Hanson et al., 2012). Companies depend on ecosystem services that maintain stable business environments (Hanson et al., 2012). Biodiversity decline can create business risks at the level of individual businesses and at the higher level of systemic risks across economies (Evison & Knight, 2010; Kedward et al., 2020, 2022; TEEB, 2010). Maintaining and restoring biodiversity is necessary to ensure the sustainability of natural resources and ecosystem services used by businesses and needed by people, in both the present and future.
4. Biodiversity is conceptualized in three types that can be nested: ecosystem diversity, species diversity, and genetic diversity (Berrisford, 2021). Ecosystem diversity is the variety of ecological systems or “ecosystems.” The second type of biodiversity is species diversity, the variety of organisms within an ecosystem. Genetic diversityis the third type of biodiversity and is the variety of genes within a species.

## The current state of biodiversity

* 1. Alberts, E. C. (2022, April 11). *Global biodiversity is in crisis, but how bad is it? It’s complicated*. Mongabay Environmental News. <https://news.mongabay.com/2022/04/global-biodiversity-is-in-crisis-but-how-bad-is-it-its-complicated/>
  2. Pennisi, E. (2021). Getting the big picture of biodiversity. *Science*, *374*(6570), 926–931. <https://doi.org/10.1126/science.acx9637>

## What is the goal? The desired state of biodiversity

* + 1. Mace, G. M., Reyers, B., Alkemade, R., Biggs, R., Chapin III, F. S., Cornell, S. E., Díaz, S., Jennings, S., Leadley, P., Mumby, P. J., Purvis, A., Scholes, R. J., Seddon, A. W. R., Solan, M., Steffen, W., & Woodward, G. (2014). Approaches to defining a planetary boundary for biodiversity. *Global Environmental Change*, *28*(1), 289–297. <https://doi.org/10.1016/j.gloenvcha.2014.07.009>

# The history of biodiversity and business

1. How did business and society arrive at a point where biodiversity has declined enough to inspire claims that we are experiencing a biodiversity crisis? “Biodiversity crisis” usually refers to the permanent disappearance of species, known as extinction. The loss of ecosystems and of genes is less commonly discussed.
2. “Biodiversity crisis” appeared in the academic literature as early as 1992, in an article about how biologists and members of the Royal Swedish Academy of Sciences could help end the crisis by conserving and rehabilitating biodiversity (Western, 1992). Swaney and Olson (Swaney & Olson, 1992) is one of the earliest academic journal articles indexed with both biodiversity and business as subject terms.
3. Management scholars began studying the organizational, network, leadership, and psychological characteristics of the response by biologists and others working in conservation (Westley, 1997).

# Measuring biodiversity and biodiversity change

## Measuring baseline biodiversity

1. Baseline biodiversity is the current state of biodiversity in an ecosystem or species. It is measured in the present and is a static rather than dynamic.
2. Measuring genetic biodiversity
3. Measuring species biodiversity
   1. eDNA measurement <https://www.naturemetrics.com/species-detection>
4. Measuring ecosystem biodiversity

## Measuring biodiversity change

1. Unlike measuring baseline biodiversity, measuring biodiversity change requires choosing a reference condition to compare against a point-in-time biodiversity measurement. The choice of reference condition often determines if change has been loss or gain, making the choice of reference condition a critical decision point in the measurement of biodiversity change. Imagine a company engaged in soybean farming wants to measure biodiversity change over 200 acres of soil ecosystem it owns and has used for 35 years to grow soybeans. The choice of reference condition will determine the biodiversity change measurement. If the reference condition is the ecosystem 3 years ago when the soil was under the same cultivation conditions as the present point-in-time biodiversity measurement, then the biodiversity change measure will likely show no change in biodiversity. However, if the reference condition is the soil ecosystem 80 years ago, when it was a prairie ecosystem rather than a soybean field, then the same point-in-time measure that showed no change in biodiversity compared to a reference condition from 3 years prior could show a biodiversity loss compared to a reference condition from 80 years prior.
2. Scientists have developed several methods to define a reference condition for measuring biodiversity change.
   1. (Gann et al., 2019)
3. Broadly, the choice of reference condition involves normative judgments about the desired ecosystem and/or biodiversity state. Scholars have called conservation biology—the field of study most associated with biodiversity conservation and restoration—an “explicitly normative science” (Galusky, 2000).
4. Strange, N., Ermgassen, S. zu, Marshall, E., Bull, J. W., & Jacobsen, J. B. (2024). Why it matters how biodiversity is measured in environmental valuation studies compared to conservation science. Biological Conservation, 292, 110546. <https://doi.org/10.1016/j.biocon.2024.110546>
5. (Ben Rejeb-Mzah et al., 2024) review indices used to measure biodiversity
6. CDC Biodiversité. (2021). *Global Biodiversity Score – 2021 Update—Establishing an Ecosystem of Stakeholders to Measure the Biodiversity Performance of Human Activities*. <https://www.cdc-biodiversite.fr/publications/global-biodiversity-score-update2021-cahier18/>
7. IFRS Foundation. (2023a). *IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information*.
8. IFRS Foundation. (2023b). *IFRS S2 Climate-related Disclosures*.
9. S&P Global Sustainable1. (2023). *Sustainability Quarterly*.
10. TEEB. (2010). *TEEB - The Economics of Ecosystems and Biodiversity for Business—Executive Summary 2010*. <http://www.teebweb.org/LinkClick.aspx?fileticket=bYhDohL_TuM=&tabid=1278&mid=2357>
11. WWF France & AXA. (2019). *Into the Wild: Integrating Nature into Investment Strategies*.

# The interdependence of biodiversity and business

*This section explains “the need for businesses to integrate biodiversity conservation into their operations to mitigate risks, enhance resilience, and contribute positively to global sustainability goals.”*

# How business affects biodiversity

1. Panwar et al. (2023) organized the biodiversity strategies of corporations into four types: conservation, restoration, compensation, and reparation. The typology is constructed on two dimensions of time and space. Time refers to whether the biodiversity strategy is executed before or after biodiversity loss occurs. Space refers to whether the biodiversity strategy is implemented where the biodiversity loss occurred or in some other location. These strategies can be generalized from corporations to other types of organizations.

## Biodiversity loss

1. Business operations are a primary cause of biodiversity loss because they alter ecosystems (land use change), remove species faster than ecosystems reproduce them (overexploitation), change species distributions (invasive species), and use ecosystems as disposal sites for damaging wastes (pollution), including causing climate change by disposing of greenhouse gas wastes into the atmosphere (Panwar et al., 2023; White et al., 2024).
2. White, T. B., Petrovan, S. O., Bennun, L. A., Butterworth, T., Christie, A. P., Downey, H., Hunter, S. B., Jobson, B. R., zu Ermgassen, S. O. S. E., & Sutherland, W. J. (2023). Principles for using evidence to improve biodiversity impact mitigation by business. *Business Strategy and the Environment*, bse.3389. <https://doi.org/10.1002/bse.3389>
3. Panwar, R., Ober, H., & Pinkse, J. (2022). The uncomfortable relationship between business and biodiversity: Advancing research on business strategies for biodiversity protection. *Business Strategy and the Environment*, bse.3139. <https://doi.org/10.1002/bse.3139>

## Biodiversity preservation

1. Achieving the sustainable use of biodiversity resources requires business managers to change or abandon some business practices and/or adopt new practices. “The conservation and development literature has identified a sequence of approaches, known as the mitigation hierarchy (BBOP, 2012), which serves as a set of guidelines for companies to develop their biodiversity protection strategies. The mitigation hierarchy suggests that companies should first try to **avoid biodiversity loss**, if not possible then **minimize what cannot be avoided**, and subsequently **remediate and offset the damage they cause**” (Panwar et al. 2023, p. 5).

# Managing business impacts on biodiversity

## The mitigation hierarchy

1. “The mitigation hierarchy suggests that companies should first try to avoid biodiversity loss, if not possible then minimize what cannot be avoided, and subsequently remediate and offset the damage they cause”

## Individual business strategies

1. **Biodiversity strategies**. Kering biodiversity strategy <https://www.kering.com/en/sustainability/safeguarding-the-planet/biodiversity-strategy/>
2. “Combining two types of temporal interventions (before loss and after loss) and two types of spatial interventions (on-site and off-site) yields four basic corporate biodiversity protection strategies: conservation, restoration, compensation, and reparation” (Panwar et al., 2023, p. 5).
   1. A biodiversity conservation strategy …
      1. Feger, C., & Mermet, L. (2022). New Business Models for Biodiversity and Ecosystem Management Services: Action Research With a Large Environmental Sector Company. *Organization & Environment*, *35*(2), 252–281.
   2. A biodiversity restoration strategy …
      1. O’Brien, S. A., Dehling, D. M., & Tylianakis, J. M. (2022). The recovery of functional diversity with restoration. *Ecology*, *103*(3), e3618. <https://doi.org/10.1002/ecy.3618>
   3. A biodiversity compensation strategy …
   4. A biodiversity reparation strategy …
      1. One risk of conceptualizing business and biodiversity through a pre- or post-biodiversity loss temporal lens is that doing so justifies causing biodiversity loss. This raises the possibility that managers believe it is acceptable to cause the extinction of genes, species, or ecosystems if a post-loss strategy is used. This is especially true of the two off-site strategies of reparation and compensation. Both strategies explicitly justify biodiversity destruction if the company’s managers pay an equivalent of the value of the biodiversity destroyed. This approach relies on the philosophical approach of weak sustainability, in which ecological resources can be destroyed if their destruction is believed to result in an equal or greater increase in social resources (Roome, 2011).
   5. Biodiversity restoration
3. **Biodiversity credits.**
4. **Biodiversity finance.**
   1. Benetto, E., Busch, T., Hickey, V., & Verones, F. (2023). Biodiversity Finance: Measuring and Managing Biodiversity in Corporations and Financial Markets. *Journal of Industrial Ecology*. <https://jie.yale.edu/biodiversity-finance-measuring-and-managing-biodiversity-corporations-and-financial-markets>
   2. Flammer, C., Giroux, T., & Heal, G. M. (2023). *Biodiversity Finance* (SSRN Scholarly Paper 4379451). <https://doi.org/10.2139/ssrn.4379451>
   3. <https://www.wbcsd.org/resources/natural-climate-solutions-for-the-voluntary-carbon-market-an-investor-guide-for-companies-and-financial-institutions/>
   4. Biodiversity bonds <https://am.pictet/en/belgium/global-articles/2024/monthly-markets-views/fixed-income/biodiversity-bonds>
   5. Moving from business- to ecosystem-level thinking (WCMC, 2023)

## Systemic change

1. **Collective action and pre-competitive collaboration**. “One Planet Business for Biodiversity (OP2B) is an international cross-sectorial, action-oriented business coalition on biodiversity with a specific focus on agriculture” (WBCSD, 2024).

# Future research and practice on business and biodiversity

## Business or industry level impacts

1. See p. 1377 in White et al. (White et al., 2024)
2. Irvine-Broque, A., & Dempsey, J. (2023). Risky business: Protecting nature, protecting wealth? *Conservation Letters*, *n/a*(n/a), e12969. <https://doi.org/10.1111/conl.12969>
3. (Roome, 1998): Sustainability strategies for industry

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