

# From Europe to North America into the world and atmosphere: a short review of global footprints and their impacts and predictions

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**Abstract** Humans are now virtually found everywhere in the world. They changed the global nitrogen and phosphate cycles, create light pollution and affect the soundscapes, even in remote wilderness areas. The destruction of the earth and its original habitat is found on land, in the ocean and now, in the atmosphere. Of note are the big impacts from the many small contaminations (e.g., Ott in Sound truth and corporate myths: the legacy of the Exxon Valdez oil spill. Dragonfly Sisters Press, Cordova, 2005). The global magnitude of this man-made impact is virtually unprecedented in human history. Indigenous populations lived within earth's carrying capacity for easily over 10,000 years, and they never caused such global impacts. It is obvious from most metrics that these problems steeply increased during the last 50 years. This suggests that global procedures and policies, and arguably driven by western industrialized countries, cultures and institutions setting the global framework, are affecting sustainability in dramatic ways. Based on documented and public sources, here I show the brief history, European thought, its global expansion, successes and global sustainability failures. There is an inherent and widely acknowledged conflict between growing the gross domestic product (GDP) and biodiversity, and when considering that we all live on one finite world. Works by Daly, Diamond, Flannery, Shtilmark, Leopold and many others make that already widely clear. Our land- and seascapes are currently overcommitted. With an increase of the human population of over 9 billion people in the next 100 years—likely earlier—we

are at the very brink of biodiversity and humanity, and of the earth as we know it. Business as usual, and purely technical and industrial environmental efforts will not help us, and instead, we need a sustainability reform of institutions, education, funding schemes, cultures and society if we want to keep striving, or at least maintain the status quo.

**Keywords** Environmental history · Global environmental crisis · Climate change · Environmental impact · Economic growth · Carrying capacity

## 1 Introduction

There are hardly any places left in this world where humans and their impacts cannot be tracked anymore (Pahlke 2004; Halpern et al. 2008; Millennium Ecosystem Assessment <http://www.millenniumassessment.org/>). We have changed the global nitrogen and phosphate cycles (Chapin et al. 2009), create light pollution that can be seen from space and affect the soundscapes and in last and remote wilderness areas. Such type of destruction is found on land, in the ocean, and now, in the atmosphere, and we were not able to reduce them in a meaningful fashion, yet (UNESCO 2009; Mace et al. 2010). The global magnitude of this man-made impact is virtually unprecedented (Wackernagel et al. 2002; see for instance Sodhi et al. 2008 for the modern human role in global amphibian declines). Indigenous populations lived within earth's carrying capacity for easily over 10,000 years and never caused such global impacts (e.g., Young and Steffen 2009; West 2006 for Papua New Guinea Krupnik and Jolly 2002 for the Arctic). It is obvious from most metrics that these problems steeply increased during the last 50 years (Millennium Ecosystem Assessment <http://www.millennium>

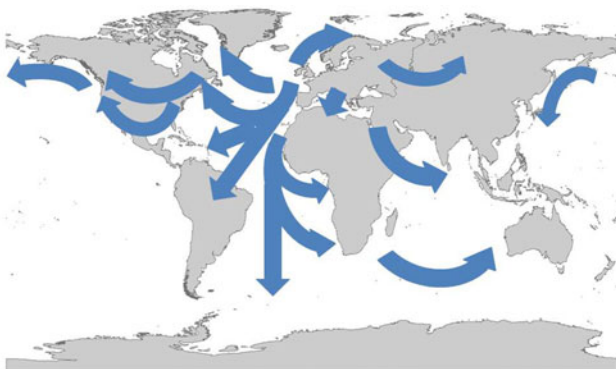
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[assessment.org/](#)). This suggests that global procedures and policies, and strongly driven by western industrialized civilization, cultures (Diamond 1999) and their institutions (Rich 1994; Stiglitz 2006; Young 2002), are affecting sustainability in dramatic ways (see Daly and Farley 2003 for Carrying Capacity and Ecological Economics). More indirect effects are brought by a large amount of poor people, squatters and which high number is also widely caused by western countries and their policies (Easterly 2006; Rosales 2008). It has been well documented that putting entire nations and people in great debt has been a global goal by many western institutions and some nations and for trying to increase global control and dominance (Rich 1994; Perkins 2004).

## 2 Underlying causes of global destruction

Considering that the mainstream thought of the industrial western society has its ties in Europe and that Europe itself dramatically overused its resources already for over 500 years (see Lotze et al. 2005 for an example of the North Sea and Lotze und Milewski 2004 for the subsequent Western North Atlantic) it is here where a root problem is located. Basically starting with J. Cooke, the European philosophy and model spread over the world (Fig. 1) and eventually manifested itself in the Americas as its core driver (Brockett 1998; Diamond 1999; Perkins 2004) and ultimately in the atmosphere. The period of “enlightenment” eventually brought many unsustainable business models (from the British Commonwealth and Central Europe to North America; Diamond 2005; see Economics review by Gaffney 1994, and Rich 1994 and Stiglitz 2006 for global economic policies), but also diseases and destruction (Diamond 1999). Of course, there can be no doubt that other factors also played a role, e.g., stochastic events and pressures by native populations (Glavin 2003). However, they usually were only local, short term and not



**Fig. 1** Global spread of the European influence, culture and impact over time

on the huge magnitude and scales of problems we are facing today. It is further clear that other cultures start to have a global influence (e.g., Glavin 2003, Elvin 2006), but it has not reached such a global and historic legacy as the western society and with the European model at its core. This is specifically true for their still missing dominance in the global legal system (e.g., TRIPS for global copyrights [http://en.wikipedia.org/wiki/Agreement\\_on\\_Trade-Related\\_Aspects\\_of\\_Intellectual\\_Property\\_Rights](http://en.wikipedia.org/wiki/Agreement_on_Trade-Related_Aspects_of_Intellectual_Property_Rights); Stiglitz 2006) and its institutions (Young 2002; Bingham 2010 for polar examples).

## 3 Examples of a western-style destruction

Good examples for this situation can be seen in the overuse of the forests of the mediterranean region, e.g., overcut Cedar forests in North Africa, devastated Karst landscapes in Yugoslavia, or with many heather landscapes in Central Europe (e.g., German “Lueneburger Heide”). And so, many animals have already declined in central Europe and when compared with their vast initial distribution, e.g., bears, wolves, moose, many marine mammals (Berthold 2003 for birds). At least for Central Europe, good science-based wildlife management is missing and further on the decline (Huettmann 2003, 2004a, b). Once central European resources got overused and destroyed, subsequent human migration occurred, and the next accessible resources were explored (Diamond 1999; Taber and Payne 2003). Easily accessible Old-Growth Forests in the US made for such a target: starting from the east coast (e.g., exploited for White Pine shipped back to England), moving south to the Louisiana swamps, and then up to the Pacific North West, now harming Western Canada and elsewhere pursuing (subsidized) heli-logging and similar activities that overall result in a loss of energy and money *per se*. The forests of British Columbia and Eastern Canada, partly Ontario and the northern Boreal Forests, are directly affected by this initial European, and now US policies (globally, and as a logical economic consequence (Stiglitz 2006), this is now pursued with Asian money). Many fish stocks, e.g., in the North Sea, in the Atlantic and now globally show this pattern. This model of pursuing the cheapest commodity, usually encouraged with governmental support, got repeated in Australia (Lines 1999) and worldwide [the extraction of tropical timber in Western and Central Africa makes for an equally good example, and as shown in the extraction patterns of whales (Francis 1984), general ecosystem trophic levels (Pauly et al. 1998) and now, oil and gas (Yergin 1991)]. It is worthwhile to note that the German and most of the central European forest landscapes had already severely been cut before the exploitation continued in North America and elsewhere.

At least three major cutting phases can be identified there: 30 Years War, Depression, Reparation Cuts. When these resources got over-exploited, people were faced with lacking resources and had to move out of the area. But by now, we are at a level where globally there is only very limited amount of natural timber left to harvest, nor can it hardly sustain climate change and global demand and with an increased human population and consumption pattern. (Industrial) plantations are globally promoted and are still on the rise (Ausubel 2002). But similar to Biofuel, their energy input and impact makes them more than rather dubious projects (they represent non-sustainable energy sinks).

Other classic examples for such an irrational overuse and management of natural resources can be seen in the history of fur animals, namely the beaver (*Castor fiber*; e.g., harvested out from central Europe, to Eastern Europe, and then pursued to commercial extinction in Russian Siberia, US and Canada with trappers moving westward till the Pacific Rim to reach their fate; Taber and Payne 2003). It is worthwhile to state that this pursuit was directly fueled with royal, governmental and military support from the west, e.g., the Hudson Bay Company. Once this commodity became “commercially” extinct, human fashion shifted to bird feathers, and then a commercial exploitation and overuse started there anew (Taber and Payne 2003), leading after the fact to the first protected area in the US and to an international legislation (The Migratory Bird Act 1916). The avian example was actually modeled after the Pacific Fur Seal devastation (Glavin 2003), which got exploited earlier by European and American pursuit just a decade before (the now extinct Steller’s Sea Cow, and the sea otter declines might speak for that fact well; Glavin 2003). More of such examples can easily be found, and including Africa (Hochschild 1998 for rubber), the Caribbean (Jackson 1997 for fisheries resources) and the Amazon (Revkin 2004 for timber and rubber) in this assessment (see Tables 1 and 2). Some of these actions got already called “Crimes against Nature.” This pattern dealing with pristine landscapes is well acknowledged (Brockett 1998),

and selected details of this type of “civilization” are shown in the UNEP Atlas “Changing of the Environment” (<http://na.unep.net/atlas/index.php>). Many other indirect indicators of this situation exist and can be seen in the status of the road development for instance (Forman et al. 2003). Dense road networks created many problems for wildlife and result into habitat and wilderness degradation (O’Connor and Jones 1997). Brown bears in North America reflect this pattern well; they now just occur in the landscapes where they have extreme protection levels or where steep slopes or remote areas make it more difficult to access areas (e.g., Arctic and boreal forests; [http://en.wikipedia.org/wiki/Grizzly\\_bear](http://en.wikipedia.org/wiki/Grizzly_bear)).

#### 4 The real reasons for reduced wilderness, endemism, meta-populations and ecological services

There is an inherent conflict between a growing gross domestic product (GDP; *sensu* modern development) and biodiversity (Czech et al. 2000; Rosales 2008). This link with a bloated economy is widely known (Wackernagel et al. 2002; Daly and Farley 2003) and has been well recognized, e.g., by the US Congress in the 1970s within the Endangered Species Act (ESA) and in writing. Considering that we all live on just one globe and on a limited space, one cannot grow infinitely. Virtually every growth is based on resources and energy throughput, and thus, we cannot grow unlimited without leaving a global impact (Daly and Farley 2003). The Law of Thermodynamics, learned already by high school students, state that clearly but basically run contrary to what many governments and NGOs still promote as sustainable development or green growth. Therefore, decisions involving space and resources must be made very careful and with a wider context (Cushman and Huettmann 2010). It becomes obvious that most of such goals cannot be achieved anymore, or will result in highly uneven distributions of wealth.

**Table 1** Selection of areas that have received historical overusage and generally based on European thought and policy

Location	Type of disturbance	Time period	Literature reference
North Sea	Various species extinctions	1500–1900	Lotze et al. (2005)
Newfoundland	Reduction of fish stocks and food chains	1800–2000	Starkey et al. (2008)
Bay of Fundy	Change of coastal ecosystem	1800–2000	Lotze and Milewski (2004)
Eastern North America (mainland)	Reduction of seabirds, fish stocks; modified, food chains and ecosystems	1700–2000	Taber and Payne (2003), Starkey et al. (2008)
Central America	Entire landscapes, e.g., agriculture and gold	1500–2000	Brockett (1998)
South America	Amazon resources, e.g., trees and rubber	1700–2000	Revkin (2004)
Central Africa	Rubber	1800–1980	Hochschild (1998)
Australia	Forest and landscape modification on a continental scale	1700–2000	Lines (1999)

**Table 2** Selection of areas that currently receive overusage and with direct European involvement

Location	Feature	Literature reference
Newfoundland and Scotian Shelf	Shipping traffic, offshore oil and gas development	Wiese et al. (2004)
Sea of Okhotsk	Fisheries, offshore oil and gas development	Huettmann (2008)
Amazon	Production of soya	<a href="http://en.wikipedia.org/wiki/Deforestation_in_Brazil">http://en.wikipedia.org/wiki/Deforestation_in_Brazil</a>
Chile	Aquafarming (salmon)	<a href="http://www.sciencedaily.com/releases/2010/06/100622112558.htm">http://www.sciencedaily.com/releases/2010/06/100622112558.htm</a>
West African waters	General overfishing	Atta-Mills et al. (2004)
Antarctica	Overfishing of specific fish stocks	Ainley et al. (2010)
Nepal	(Norwegian) development aid helping to transform sustainable subsistence crop to cash crop	<a href="http://www.norway.org.np/">http://www.norway.org.np/</a> Norwegian Agency for Development Cooperation (NORAD)

Just looking at the airline traffic alone will make this picture clear: planes need space to land, fuel to fly, and cargo and passengers to transport. And these concepts have dramatically increased over the last 60 years. In such a framework, it is almost impossible that resources remain protected and that diseases and invasive species are not spreading worldwide, stressing and disturbing habitats (Knowles and Diggle 2009 for Antarctica for instance). Works by Diamond (1999), Flannery (2002), Shtilmark (2003), and first and foremost, Leopold (1949), but also many others (Lines 1999, Glavin 2003) make that already widely clear (formalized in Ecological Economics; Daly and Farley 2003). Such books should be read and taught world-wide as standard literature on sustainability and beyond. It is noteworthy that the works from Aldo Leopold for instance are already around since the 1930s. But it is still widely ignored in daily policy actions, and hardly known even in central Europe or Australia.

An applied example of this situation where European thought destroys the environment can be seen in the Arctic, where a massive shipping and transportation network is planned and built with EU help (Bingham 2010) because climate change is conveniently clearing sea ice passages (CAFF 2010; Johnsen et al. 2010). It is clear that the polar bears will not be able to sustain such pressures for long (experts predict extinctions 2050 onwards), and regardless of a listing as being “endangered” or not. Summer sea ice makes for an essential habitat foundation for such species, but man-made climate change will make this ecosystem extinct (see Wang and Overland 2009 on predicted declines til 2040). As long as central Europe and other nations (e.g., US and China) keep promoting and consuming fossil fuel, they are directly involved in the killing of arctic habitats and its animals and people. The liabilities are quite clear here (Rosales 2008) but do not get enforced yet (Stiglitz 2006; e.g., by a world court of justice or in a similar mechanism with the UN; Radermacher 2004). So far, and

despite many new laws and judged by high global extinction rates, we have not developed a good legal mechanism yet that truly achieves (Mace et al. 2010), and one that protects and maintains the atmosphere and specific temperatures, and subsequently these habitats (Johnsen et al. 2010 for an Arctic example). The habitat of snow and ice (= cool temperatures) makes for a concept difficult to comprehend to most of the urban citizens and in temperate zones where many globally relevant decisions are made. But it forms an essential ecosystem for many people, animals, plants and for a healthy atmosphere alike. Destroying it leads to many casualties (Krupnik and Jolly 2002; Paehlke 2004; Rosales 2008 for environmental justice). But the huge demand for immediate resources, e.g., oil, gas and mineral resources, and its development plans to fuel huge consumptions clearly stand in the way (Bingham 2010).

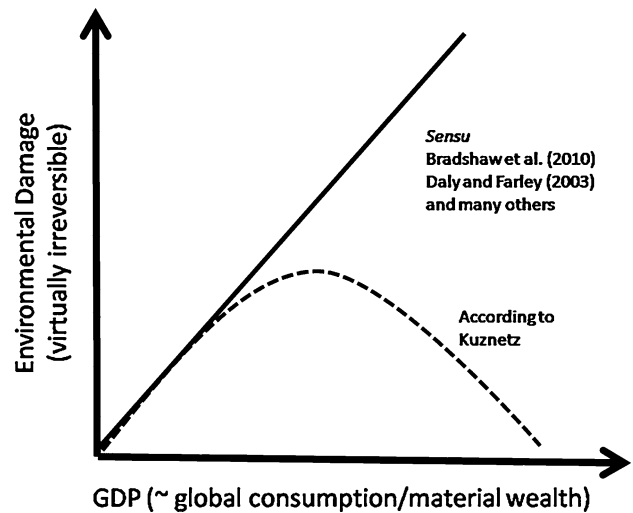
## 5 Widely failed environmental mitigations, so far

The current approaches and plans to deal with these issues are widely based on western laws, financial compensation schemes, facilitation, political compromising and *ad-hoc* protected areas (= a concept of building fences). But they all unite on the fact that they have widely failed for achieving global biodiversity goals and for maintaining the world’s atmosphere (Johnsen et al. 2010). These must be seen as serious failures and demand a change and rethinking (Netherlands Environmental Assessment Agency 2010). The current concepts cannot bring back things that are gone; there is no resiliency left. While the global consumption levels are increasing, notions like carrying capacity, ethics or environmental justice are virtually ignored and marginalized (Spash 2009).

Indicators of the global crisis can clearly be seen in the missed social goals of the U.N. since the 1990s (Easterly 2004; Paehlke 2004), in the recently missed Biodiversity

Conservation Targets 2010 (Mace et al. 2010), in missed Kyoto protocol agreements and in the directly related global financing crisis. Our land- and seascapes are over-committed (Loring and Gerlach 2010 for an example of the Yukon river). Doing the math on this subject easily shows the magnitude of the problem: Alone with an increase of the human population of over 9 billion people in the next 100 years—likely earlier—we are at the brink of biodiversity, economy and humanity, and of the earth as we know it. “Business as usual” will not help us. We need a sustainability reform of institutions, education, culture and society (Netherlands Environmental Assessment Agency 2010). This includes sustainable funding schemes that actually achieve, e.g., by making sure to stay within the ecological carrying capacity of the earth ([http://en.wikipedia.org/wiki/Ecological\\_economics](http://en.wikipedia.org/wiki/Ecological_economics); Daly and Farley 2003).

Whereas a call for more efficient production processes will not halt the problem and just increase the use-up of resources (widely known in Economics as Jevon’s Paradox [http://wikipedia.atpedia.com/en/articles/j/e/v/Jevons\\_paradox.html](http://wikipedia.atpedia.com/en/articles/j/e/v/Jevons_paradox.html)). Another misbelieve lies in the Environmental Kuznets Curve (EKC) (Fig. 2 stating that environmental problems would automatically get better with wealth; Stern 2004; Daly and Farnes 2002). As a matter of fact, this function is not applying to habitats, wildlife and extinction and was already widely disproven in Los Angeles’s acid rain discussion (where now over 85% of California’s wetlands got lost due to road and other development) and with global warming (where a major component of the problems are caused by the wealthy west; Bradshaw et al. 2010). Finally, with an ongoing policy of economic growth and always trying to boost the GDP now for over 50 years, e.g., through the EU and the G8, we have NOT fixed the global poverty at all yet, but instead created a global separation like never before with few very rich people and the majority being poor (50% of the world live from less than 3\$ a day; Easterly 2006, Rosales 2008). Such situations are widely caused by a global regime that is driven by an “Iron Triangle” (Neoclassic Economists, International Corporations and Military; Czech et al. 2003), but which leaves out



**Fig. 2** The economic Kuznets curve concept: a devastating concept on a global scale (following Daly and Farley 2003; Stern 2004; Bradshaw 2010)

the global citizens and the earth’s sustainability. This truly needs a change; many experienced, and as well young, ecologists have realized and expressed it (Starzomski et al. 2004; Power and Chapin 2010).

**6 Better solutions for reaching global sustainability**

Judged by all metrics available, e.g., environmentally, economically and socially, the world has reached a state that is widely unsustainable, very fragmented and at the brink of collapse (Diamond 2005, Netherlands Environmental Assessment Agency 2010; Table 3). We are not really scientific in our decision-making (O’Connor 2000, Anderson et al. 2003), but should be and must act with reason. Existing and dominating world orders and philosophies are not providing good answers, and we are moving into bigger changes one way or another (pro-actively or by crisis). This is widely acknowledged, e.g., within the European Commission and the Club of Rome ([http://de.wikipedia.org/wiki/Global\\_Marshall\\_Plan\\_Initiative](http://de.wikipedia.org/wiki/Global_Marshall_Plan_Initiative); Radermacher 2004). It is unlikely that one big answer will

**Table 3** Selected locations that are scheduled or predicted to be used extensively

Location	Time period	Literature reference
Arctic Ocean	2015–2050	CAFF (2010), Johnsen et al. (2010)
Shelf edges (worldwide)	2010–2050	Pauly et al. (2003)
Deep Sea (worldwide)	2015–2050	Pauly et al. (2003), McIntyre (2010)
Antarctic Ocean	2010–2050	Convention on the Conservation of the Antarctic Marine Living Resources ( <a href="http://www.ccamlr.org/">http://www.ccamlr.org/</a> )
Amazonia (deforestation due to soy beans)	2010–2050	<a href="http://en.wikipedia.org/wiki/Criticisms_of_Cargill">http://en.wikipedia.org/wiki/Criticisms_of_Cargill</a>
Coral Reefs	2010–2050	McIntyre (2010)



provide the immediate solution. Likely, a transition phase will need to happen and where hopefully no more and new conflicts will occur. Many institutions either will run out of purpose or lack funding and budgets to do their work, e.g., recent federal budget freezes by the US government as a start. It is clear though that the world does not have much more resources to offer and that by now we have used up most of them. Working toward a stable economic system that allows for global well-being is a goal every one (including the major world religions, The World Bank, The International Monetary Fund and G8 for instance) fully subscribe to. But this can only be possible within carrying capacity and is part of good ecology. It is now on us to make it happen as soon as possible and turn into a science-based sustainable society which uses wisdom, reason and best possible opportunities for an adaptive sustainability management (Walters 1986; Anderson et al. 2003, Huettmann 2007; Cushman and Huettmann 2010).

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## References

- Anderson DR, Cooch EG, Gutierrez RJ, Krebs CJ, Lindberg MS, Pollock KH, Ribic CA, Shenck TM (2003) Rigorous science: suggestions on how to raise the bar. *Wildl Soc Bull* 31:296–305
- Atta-Mills J, Alder J, Sumaila UA (2004) The decline of a regional fishing nation: the case of Ghana and West Africa. *Nat Res Forum* 28:13–21
- Ausubel J (2002) Chapter 33: Maglevs and the vision of St. Hubert—or the great restoration of nature: why and how. In: Steffens et al (eds) *The challenges of a changing earth. Proceedings of the global change open science conference, Amsterdam Netherlands, 2001*
- Berthold P (2003) Changes in the breeding bird fauna of two southern German rural communities during recent decades—lost paradises? *J Ornithol* 144:385–410
- Bingham LB (2010) Think again: the Arctic. *Foreign Policy* 8:1–7
- Bradshaw C, Giam X, Sodhi NS (2010) Evaluating the relative environmental impacts of countries. *PLoS ONE* 5(5):e10440. doi:10.1371/journal.pone.0010440
- Brockett CD (1998) *Land, power and poverty: agrarian transformation and political conflict in Central America, Second Edition (Thematic Studies in Latin America)*. Westview Press, Boulder, CO
- CAFF (2010) *Arctic biodiversity trends 2010-selected indicators of change*. CAFF International Secretariat Akureyri, Iceland
- Chapin FS, Kofinas GP, Folke C (eds) (2009) *Principles of ecosystem stewardship: resilience-based natural resource management in a changing world*. Springer, New York
- Cushman S, Huettmann F (2010) *Spatial complexity. Informatics and wildlife conservation*. Springer, Tokyo
- Czech B, Krausman PR, Devers PK (2000) Economic associations among causes of species endangerment in the United States. *Bioscience* 50:593–601
- Czech B, Allen E, Batker D, Beier P, Daly H, Erickson J, Garretton P, Geist V, Gowdy J, Greenwalt J, Hands H, Krausman P, Magee P, Miller C, Novak K, Pullis G, Robinson C, Santa-Barbara J, Teer J, Trauger D, Willer C (2003) The iron triangle: why the wildlife society needs to take a position on economic growth. *Wildl Soc Bull* 31:574–577
- Daly H, Farley J (2003) *Ecological economics: principles and applications*. Island Press, Washington
- Diamond J (1999) *Guns, germs and steel: the fates of human societies*. Norton and Company New York, New York
- Diamond J (2005) *Collapse: how societies choose to fail or to collapse*. Penguin Publishers, New York
- Easterly W (2006) *The White Man's burden: why the west's efforts to aid the rest have done so much ill and so little good*. Penguin Press HC, New York
- Elvin M (2006) *The retreat of the elephants: an environmental history of China*. Yale University Press, New Haven
- Flannery T (2002) *The future eaters*. Grove Press, Sydney
- Forman RTT, Sperling D, Bissonette JA, Clevenger AP, Cutshall CD, Dale VH, Fahrig L, France R, Goldman CR, Heanue K, Jones JA, Swanson FJ, Turrentine T, Winter TC (2003) *Road ecology: science and solutions*. Island Press, Washington
- Francis D (1984) *Arctic chase: a history of whaling in Canada's North*. Breakwater Books, Toronto
- Gaffney M (1994) *The corruption of economics*. Shephard-Walwyn, London
- Glavin T (2003) *The last Great Sea: a voyage through the human and natural history of the North Pacific Ocean*. Greystone Books, Vancouver
- Halpern BS et al (2008) A global map of human impact on marine ecosystems. *Science* 319:948
- Hochschild A (1998) *King Leopold's ghost: A story of greed, terror, and heroism in colonial Africa*. Pan Macmillan, New York
- Huettmann F (2003) Unglaublich fortschrittlich. *Das Unabhaengige Hochschulmagazin* 5:24–25
- Huettmann F (2004a) *Wildlife management in Deutschland: aufbruch dringend von Noeten*. *Niedersaechsischer Jaeger* 19:20–23
- Huettmann F (2004b) *Wildtierinventuren: Stellenwert fuer eine Jagd mit Zukunft*. *Waldinformation* 2:32–33
- Huettmann F (2007) *Modern adaptive management: adding digital opportunities towards a sustainable world with new values*. *Forum Public Policy: Clim Chang Sustain Dev* 3:337–342
- Huettmann F (2008) *Marine conservation and sustainability of the Sea of Okhotsk in the Russian Far East: an overview of cumulative impacts, compiled public data, and a Proposal for a UNESCO world heritage site*. In: Nijhoff M (ed) *Ocean year book, vol 22*. Halifax, Canada, pp 353–374
- Jackson J (1997) *Reefs since Columbus*. *Coral Reefs* 16:S23–S31
- Johnsen KI, Alftan B, Hislop L, Skaalvik JF (eds) (2010) *Protecting arctic biodiversity*. United Nations Environment Programme, GRID-Arendal, Norway. <http://www.grida.no>
- Knowles K, Diggle M (eds) (2009) *Health of Antarctic wildlife: a challenge for science and policy*. Springer, New York
- Krupnik I, Jolly D (eds) (2002) *The earth is faster now: indigenous observations of Arctic environmental change*. The Arctic Research Consortium of the United States (ARCUS), Fairbanks
- Leopold A (1949) *A Sand County almanac*. Ballantine, New York
- Lines W (1999) *Taming the Great South Land: a history of the conquest of nature in Australia*. University of Georgia Press, Atlanta
- Loring PA, Gerlach C (2010) *Food security and conservation of Yukon River Salmon: are we asking too much of the Yukon River*. *Sustainability* 2:2965–2987

- Lotze HK, Milewski K (2004) Two centuries of multiple human impacts and successive change in a North Atlantic food web. *Ecol Appl* 14:1428–1447
- Lotze HK, Reise K, Worm B (2005) Human transformations of the Wadden Sea ecosystem through time: a synthesis. *Helgol Mar Res* 59:84–95
- Mace GM, Cramer W, Diaz S, Faith DP, Larigauderie A, Le Prestre P, Palmer M, Perrings C, Scholes RJ, Walpole M, Walther BA, Watson JA, Mooney HA (2010) Biodiversity targets after 2010. *Environ Sustain* 2:1–6
- McIntyre AD (ed) (2010) *Life in the World's Oceans: diversity, distribution and Abundance*. Census of Marine Life (COML) and Wiley-Blackwell Publisher, Oxford
- Netherlands Environmental Assessment Agency (2010) *Rethinking global biodiversity strategies: exploring structural changes in production and consumption to reduce biodiversity loss*. PBL, The Hague
- O'Connor R (2000) Why ecology lags behind biology. *Scientist* 14:35
- O'Connor R, Jones MT (1997) Using hierarchical models to assess the ecological health of the nation. Transactions of the 62nd North American wildlife and natural resources conference. 62:501–508
- Ott R (2005) *Sound truth and corporate myths: The legacy of the Exxon Valdez oil spill*. Dragonfly Sisters Press, Cordova
- Paehlke R (2004) *Democracy's dilemma: environment, social equity, and the global economy*. MIT Press, Cambridge
- Pauly D, Christensen V, Dalsgaard J, Froese R, Torres F Jr (1998) Fishing down marine food webs. *Science* 279:860–863
- Pauly D, Alder J, Bennett E, Christensen V, Tyedmers P, Watson R (2003) The future of fisheries. *Science* 21(302):1359–1361. doi: [10.1126/science.1088667](https://doi.org/10.1126/science.1088667)
- Perkins J (2004) *Confessions of an economic Hitman*, 3rd edn. Berrett-Koehler Publishers, New York
- Power ME, Chapin S (2010) Planetary Stewardship, with an introduction from the Editor-in-Chief. *Bull Ecol Soc Am* 91:143–175. doi: [10.1890/0012-9623-91.2.143](https://doi.org/10.1890/0012-9623-91.2.143)
- Radermacher FJ (2004) Balance or destruction: eco-social economy as the key to global sustainable development. Vienna, Ecosocial Forum Europe
- Revkin A (2004) *The burning season: The murder of Chico Mendes and the fight for the Amazon rainforest*. Island Press, New York
- Rich B (1994) *Mortgaging the earth: the World Bank, environmental impoverishment, and the crisis of development*. Beacon Press, Boston
- Rosales J (2008) Economic growth, climate change, biodiversity loss: distributive justice for the global north and south. *Cons Biol* 22:1409–1417
- Shtilmark FR (2003) *History of the Russian Zapovedniks 1895–1995*. Russian Nature Press, Edinburgh
- Sodhi NS, Bickford D, Diesmos AC, Lee TM, Koh LP et al (2008) Measuring the meltdown: drivers of global amphibian extinction and decline. *PLoS ONE* 3(2):e1636
- Spash CL (2009) *Social ecological economics*. CSIRO Sustainable Ecosystems, Canberra
- Starkey DJ, Holm P, Barnada M (2008) *Oceans past: management insights from the history of marine mammal populations*. Earthscan, UK and US
- Starzomski BM, Cardinale BJ, Dunne JA, Hillery MJ, Holt CA, Krawchuk MA, Lage M, McMahon S, Melnychuk MC (2004) Contemporary visions of progress in ecology and thoughts for the future. *Ecol Soc* 9:1–14
- Stern DI (2004) The rise and fall of the environmental Kuznetz curve. *World Dev* 32:1419–1439
- Stiglitz JE (2006) *Making globalization work*. W.W. Norton & Company, New York
- Taber RD, Payne NF (2003) *Wildlife, conservation, and human welfare: a United States and Canadian perspective*. Krieger Publishing Company, Malabar
- UNESCO (2009) *Climate change and Arctic sustainable development: scientific, social, cultural and educational challenges*. UNESCO, Paris
- Wackernagel M, Schulz NB, Deumling D, Linares AC, Jenkins M, Kapos V, Monfreda C, Loh J, Myers N, Norgaard R, Randers J (2002) Tracking the ecological overshoot of the human economy. *Proc Nat Acad Sci* 99:9266–9271
- Walters C (1986) *Adaptive management of renewable resources*. Blackburn Press, Caldwell
- Wang M, Overland JE (2009) A sea ice free summer Arctic within 30 years? *Geophys Res Lett* 36:1–5
- West P (2006) *Conservation is our Government now: the politics of ecology in Papua New Guinea*. Duke University Press, Durham
- Wiese F, Robertson G, Gaston A (2004) Impacts of chronic marine oil pollution and the murre hunt in Newfoundland on thick-billed murre *Uria lomvia* populations in the eastern Canadian Arctic. *Biol Conserv* 116:205–216
- Yergin D (1991) *The prize: The epic quest for oil, money and power*. Simon and Schuster, New York
- Young OR (2002) *The institutional dimensions of environmental change: Fit, interplay, and scale*. MIT Press, Cambridge
- Young O, Steffen W (2009) The earth system: sustaining planetary life-support systems. In: Chapin FS, Kofinas GP, Folke C (eds) *Principles of ecosystem stewardship: resilience-based natural resource management in a changing world*. Springer, New York, pp 295–318