

Education in Defence of Biodiversity. Will the Ecological and Ethical Footprint Counteract Environmental Changes?

Edukacja w obronie bioróżnorodności. Czy ślad ekologiczno-etyczny zrównoważy zmiany środowiskowe?

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Abstract

At the turn of the 20th and 21st centuries, we collectively experienced, and still do, a new kind of border situation – a global environmental disaster. It connects with a newly recognised form of destruction, outside the sphere of biodiversity, which has been called solastalgia. The main source of both solastalgia and irreversible devastation of the biosphere seems to be the attitude of extractivism, that has been lasting steadily for last few centuries. There is hope that adequately selected teaching methods of the ecological footprint can effectively raise the sensitivity, empathy and environmental awareness of older and younger generations of consumers. A rescue for biodiversity seems to be biocentric education – perhaps ethical footprint, as an offshoot of ecological footprint, is able to transform *Homo sapiens* into *Homo sapiens* again.

Key words: biodiversity, ecological footprint, extractivism, solastalgia, *homo sapiens*

Streszczenie

Na przełomie XX i XXI wieku kolektywnie doświadczyliśmy i wciąż doświadczamy nowego rodzaju sytuacji granicznej – globalnej katastrofy środowiskowej. Łączy się ona z nowo zauważoną formą niszczenia, poza sferą bioróżnorodności, zwaną solastalią. Źródłem zarówno solastalii, jak i nieodwracalnej dewastacji biosfery, wydaje się być postawa ekstraktywistyczna, która trwa nieprzerwanie od kilku stuleci. Istnieje nadzieja, że adekwatnie dobrane metody nauczania śladu ekologicznego mogą efektywnie podnieść wrażliwość, empatię i świadomość ekologiczną starszych oraz młodszych generacji konsumentów. Ratunek dla bioróżnorodności wydaje się leżeć w biocentrycznej edukacji – być może ślad etyczny, jako efekt ekologicznego, jest w stanie przekształcić *Homo sapiens* ponownie w *Homo sapiens*.

Słowa kluczowe: bioróżnorodność, ślad ekologiczny, ekstraktywizm, solastalgia, *homo sapiens*

Introduction

Education is a prerequisite for sustainable, and therefore safe, lasting and effective development. In turn, the didactic and pedagogical consequence of the work is both individual development in the area of awareness, sensitivity and worldview, as well as collective development, in terms of cooperation, joint responsibility or improved quality of life. It will be no great misuse to state that ethics in the 21st century probably faces the greatest challenge in the history of philosophy and pedagogy – the actual

participation in saving life on Earth. At the turn of the 20th and 21st centuries, we collectively experienced, and still do, a new kind of *limit situation* or *Grenzsituation* – a global environmental disaster. Assuming that the attitude of people towards all forms of life is shaped e.g. by opinion-forming influencers, such as politicians, scientists, but also teachers at every level of human education, then ethical education of subsequent generations of the Earth's inhabitants acquires a unique relevance. It is not only a moral notion, but also an existential one. Thus, the existential challenge of raising the level of

knowledge, awareness and sensitivity in people especially concerns applied ethics and normative ethics, which take into account ecological issues and refer to the concepts of responsibility, duty (obligation) and the value and quality of life.

The article will outline a new form of deterioration – outside the sphere of biodiversity – referred to as *solastalgia*. Without anticipating specifics, it should be mentioned that solastalgia is associated with the mental aspect of modern people, and is caused by the cultural upholding of the myth of anthropocentrism and the claims arising from it towards our cultural environment. An effective strategy for minimizing various forms of deterioration seems to be the proposed involvement of the pedagogical community in shaping biocentric attitudes and behaviors of the young generation. A question arises as to what to teach and what educational methods to use? A didactic answer may be scenarios teaching the theory and practice of the so-called ecological footprint, which includes e.g. elements of fair consumption, fair trade and a responsible attitude towards the biosphere. It seems that adequately selected teaching methods of the ecological footprint can effectively raise the sensitivity, empathy and environmental awareness of audiences, pupils, and students. This notion was introduced to ecological research in 1994 by Prof. Mathis Wackernagel together with prof. Wilhelm Rees, who was the promoter of his PhD thesis on this subject. Perhaps teaching about the ecological footprint translates into an increase in the so-called ethical footprint (Schaltegger et al., 2015, p. 65), i. e. the quantity and quality of implemented values of care, respect and responsibility, in all acts of consumption, in relation to one's natural and social environment.

The article does not focus on economic factors, instead emphasizing the role of education, including eco-ethical and biocentric education, as one of the strategies to change consumer thinking. After all while climatologists, environmentalists, zoologists and botanists refer to facts and scientific knowledge, they should be supported by an area of environmentally aware humanists to include moral principles, cultural norms and hierarchies of values in the information and education process.

Selected examples of biodiversity deterioration

The biosphere gives signals that some of its regions are becoming more and more disturbed. Few people outside the hermetic community of specialists are aware of this. It only took about half a century to trigger global changes. Currently, we have e.g. an accelerated increase in the concentration of carbon dioxide and methane in the atmosphere. And both these concentrations contribute year by year to the accelerated increase in the average temperature at the Earth's surface. We know this based on analyzes of the so-called Earth's sensitive climate points,

made thanks to the *Potsdam Institute for Climate Impact Research*, with a significant help from oceanographer and climatologist Stefan Rahmstorf. The first such point is the Arctic (Johannessen, Bengtsson et al., 2004) as the fastest-warming region on Earth, as well as Greenland (Gregory, Huybrechts, Raper, 2004) and West Antarctica (Bamber, Riva et al., 2009), where the complete disappearance of ice is already a matter of time in the current emission scenario of anthropogenic greenhouse gases. The second point involves the circulation systems of ocean water, including climate anomalies in the Pacific (Diaz, Hoerling, Eischeid, 2002) and the abatement of monsoons. A mere fifty years ago, monsoons intensively fed the Amazonian rains. Nowadays, they are getting weaker decade by decade, and the Amazon ecosystem is becoming steppe-like. Similarly, monsoons that mark their activity in the Indian Ocean also bring less and less rainfall to India and Bangladesh, which causes violent, troublesome and long-term drought (O'Brien, Leichenko et al., 2004). Here however, we are most interested in the third sensitive point of the Earth's climate, which is susceptible to destruction not only through the emission of carbon dioxide into the atmosphere, but also through daily direct interference of various social groups, more or less consciously exploiting this point. The issue at hand is the biosphere ecosystems that include forests.

In 2015, intentional grubbing and burning of forest areas in Borneo or Sumatra under the monocultural cultivation of oil palms led to the greatest environmental disaster so far in the 21st century. This involves drying out Indonesian peat forests, which causes fires and, as a result, kill animals (including the Bornean orangutan [*Pongo pygmaeus*], clouded leopard [*Neofelis nebulosa*], sun bear [*Helarctos malayanus*]) in the surrounding nature reserves. The events in Indonesia in 2015 were described in the media as crimes against humanity, where responsibility is dispersed between food concerns, their smaller subcontractors and local political authorities. *The fires devastating Indonesia have been called a 'crime against humanity'*, wrote reporter Oliver Balch for *The Guardian* (Balch, 2015). To make things worse, instead of the normally expected tropical rainfall, there were anomalous droughts in Borneo, which in turn, initiated huge uncontrollable fires in the autumn of 2015 (possibly created by burning forests). This was due to many forest areas were being grubbed up there for the cultivation of oil palm and eucalyptus. The lack of a normal biotic pump bringing about strong moisture became the cause of a massive drying of areas that were largely deforested. Apart from tropical forests and forest crops, peat bogs also burned, emitting huge amounts of carbon dioxide and methane to the atmosphere (Hashimoto, Kojima et al., 2000).

It is also worth mentioning that the drying up of the Amazon is a very alarming signal. There is less and

less precipitation in this geographical region. The direct cause is global warming, resulting in the weakening of incoming monsoons from west Africa (Fu, Yin et al., 2013), and the indirect cause – long-term clearing of the Amazon forests. Grubbing up causes the destruction of forests as a *buffer* stabilizing the climatic conditions on Earth, which strengthens the direct cause of drought – global warming (Phillips, Aragão, 2009).

The last example of biodiversity problems is the extinction and pollution of the seas and oceans. Both shallow and thermophilic (but up to 26°C) coral reefs from tropical areas, as well as deep-water and cold-water coral reefs from around the world, and especially from the North Atlantic waters off the coast of northern Europe, are just as exposed to temperature rise, acidification and deoxygenation. They ecosystems are very sensitive to climate change. Warming the world by just 1.5 degrees Celsius will mean the destruction of at least 90% of all reef populations worldwide. And warming temperatures by 2°C will bring about near-extinction of these ecosystems together with the corals that form them and other species dependent on reefs as an undersea habitat. The increasing temperatures come together with plastic water pollution, as the risk of coral reef diseases increases after contact with plastic found in marine waters. Worse still, many marine organisms cannot tell apart between plastic garbage and food, while those that do eat plastic will die of starvation, unable to digest it. Pollution with plastic is currently so high that it has become the [1] theme of the World Earth Day 2018 under the slogan *End plastic pollution*. It is worth noting that currently the largest garbage patch in the middle of the Pacific is 99.9% plastic; it weighs as much as 45-129 thousand tonnes and has an area of 1.6 million square kilometers, which is five times larger than the area of Poland (Ulanowski, 2018). It drifts between Hawaii and California due to the sea currents. Microplastic particles are already present in all water systems in the world, such as streams, rivers, lakes or seas, including the Arctic and Antarctic regions (Bucci, Rochman, 2018).

Are there any other dangers besides the deterioration of biodiversity, of which we may not be aware? The philosopher Glenn Albrecht answers this question positively – there is an additional psychological danger called solostalgia.

Threat: solostalgia due to extractivism

Albrecht created a concept describing a specific state of mental suffering that we can experience in a situation where our familiar places that we knew, loved and where we felt safe, are so extremely changed by the exploitation of raw materials and/or emerging buildings that they become foreign and unrecognizable to us. Albrecht calls such a condition *solostalgia* (Latin: *solace* – relief, consolation, and gr. *algos* – pain), which he defines as *anxiety and longing for*

home experienced when one is at home (Klein, 2014, p. 168). It is the anxiety, frustration and longing that one feels when returning to an old place, where one has had deep, positive feelings, and this place turns out to be so thoroughly changed in connection with the progress of urbanization and/or destruction of nature that it now is completely foreign and menacing. In such case, being in the right place geographically, we do not emotionally recognize this place. Friedrich Dürrenmatt described this phenomenon in his memoirs: *When I visited the village again several years ago, I only recognized the hills that surround it. The garden lacked trees, the church was rebuilt, everything became smaller, tighter, although the village itself has grown, and with a lot of industry. I felt alien* (Dürrenmatt, 1986, p. 23). Global climate change has led to a situation where the whole world – being a home – is revealed as unfriendly, menacing, and unpredictable. Furthermore, according to Albrecht, we collectively experience both local and global solostalgia. It is a combination of nostalgia with claustrophobia on a planetary scale, caused by our suicidal desolation of the entire Earth. Such exploitation is possible thanks to the collective psychological repression of the elements of socio-economic metabolism – it means repression of facts concerning the acquisition, consumption and excretion and biosphere contamination with waste. This denial of predatory exploitation along with unrestrained hyper-consumerism can be specified as the economic attitude of extractivism. It is this extractivism as a learned and uncritically upheld restitutionary attitude and consumption attitude towards the world, that seems to be the main source of both solostalgia (in mental area) and the source of irreversible devastation of the biosphere (in physical area). Let's take a closer look at this issue.

Said carelessness and psychological repression of the damage we do constitute the core of the economic model called extractivism, which consists in extracting more and more raw materials in accordance with the ideas of endless development and anthropocentric dominance. As Naomi Klein wrote, extractivism is the attitude and type of mentality that reduces biodiversity to a mere usable value, denying any other value of wildlife but the utility. Both the biosphere and its inhabitants are only perceived in terms of resources to be exploited. *Extractivism is a one-sided, domineering attitude to the Earth, relying solely on taking from it* (Klein, 2014, p. 169). It is the opposite of responsible, sustainable resource management. Klein combines the attitude of extractivism with the idea of destroying nature and people in the name of a higher, i.e. anthropocentric good. The Western culture most often understands good that sanctifies the means as the constant economic progress of a racially superior Europe. Thus, extractivism manifests itself in the activities of imperialist exploitation of the peripheries and the colonization of the world as an area of conquest, and not as a home

that requires care. A typical strategy of extractivism in the form of colonization has for hundreds of years consisted in conquering and exhausting the deposits, to then abandon the now-dead host and move elsewhere to exploit further riches (Klein, 2014, p. 170). A remedy to solastalgia and its source – the extractivist attitude – seems to be biocentric education that stimulates consumer awareness; sensitivity to suffering; a sense of responsibility for our shopping practices, an attitude of care and a sense of respect for nature. Such an educational project that combines said eco-friendly values seems to be the ecological footprint concept, that is, the task of making consumers aware of the measure of the individual demand for the planet's resources necessary to stay alive. In the next chapter, we will discuss how to consciously trace our own consumption path, determining what area of the ecosystem we need to fulfill our needs.

Ecological footprint, or rescue in education

Since people do not operate in an informational vacuum, a reliable eco-education should become a guidepost for our consumer activities. The current dominance of anthropocentric education has cemented the unconscious species chauvinism in our attitudes, preferences and choices. Teaching the theory of William E. Rees, called the ecological footprint, is a method of making young generations aware that, in a sense, each and every one of us has arisen from the food that they eat, that is, from the organic background that surrounds us. In the existential and even ontological aspect, we are completely integrated with the Earth. For this reason, the primary question of ecological education, which one should ask oneself and the next generations, should be: *how much of the world's surface is intended only to feed me personally and maintain a lifestyle that I'm used to?* The answer will be our *personal ecological footprint*. The *footprint* is a measure of human demand for the planet's resources and a symbol of our unsustainable position. The ecological footprint was defined as the total area of productive ecosystems, necessary to constantly keep alive any particular community or individual, whose location on the planet is irrelevant. This subsistence concerns above all the acquisition of fossil fuels and natural resources, so the ecological footprint is left by contemporary consumers of the industrial and post-industrial era.

The main educational task is to realize the amount of natural resources used during our consumption and further waste disposal. In other words, the footprint is the remnant of one's existence, which is reflected in a given area in the form of a habitat destroyed in the way of excessive or unsustainable exploitation of such habitat. An individual or group can always import a certain raw material that has run out, but such evasion does not solve the problem of an imprinted *havoc* footprint, as it only transfers exploitation to

another geographical area. Thus, the educational question is: how much land and raw materials, regardless of their location, is needed to extend the existence of individuals in a given region. Here we arrive to the issue of pro-ecological didactics, which may awaken a biocentric attitude among students and pupils. Pedagogically speaking, the most convenient are educational scenarios based on real *case studies*, concerning the exploitation of nature, human resources and the killing of animals. Therefore, teachers can use ready-made scenarios of fair, responsible consumption such as environmental and *fair trade* organizations have in the area of:

- a) food products – inform about the quantity of plastic used and accentuate preference for glass or paper (biodegradable) packaging;
- b) clothing – present, e.g. the harmful realities of keeping and breeding animals for fur;
- c) cosmetics – make people aware of the practice of testing chemicals on animals and the availability of cosmetics not tested on animals;
- d) mobile technologies – inform about toxic materials contained in computers and telephones and the need to recycle used equipment;
- e) waste – implement the 3R thinking scheme: *reduce, reuse, recycle* in every aspect of consumption.

Referring to shared values and social norms, these examples of ways of awakening responsibility, sensitivity and respect may translate into more moral, modest shopping behavior. This would be the first step towards halting hyperconsumerism.

Moreover, from a biocentric point of view, human existence, shown by Martin Heidegger as being-in-the-world, takes on a broader – ecological – aspect. Biocentrically speaking, in a sense, we have never been born. Placenta is the means by which the fetus receives nutrition. The umbilical cord is part of the placenta that is connected to the mother's womb. After childbirth, this relationship changes into a relationship with the Mother Earth. It is She who provides us with all the food and takes all our droppings away. A person transforms from an organism feeding inside a parent's body into an organism feeding in the womb of nature. Thus, a large dose of conceit and megalomania is characterized by placing humans at the top of the Aristotelian ladder, as the crowning achievement in the hierarchy of organic beings. Such unique features of *Homo sapiens* as creative shaping of our surroundings; understanding the world and oneself through symbolic forms, or creating mental extensions in the outside world, all this is paid for obtaining various means of livelihood and transforming the environment (exploitation of the bioproductive raw materials). Biocentric education should therefore accurately inform about the fact that our planet's capacity has its limits. The greater the portion of the biosphere *Homo sapiens* usurps, the less space is left to be used by other species who also deserve to be respected. Given that

millions of species have turned into a handful of specimens or are extinct, all consumers are in varying degrees responsible for the fact that only few survivors remain from the past population of life forms. When discussing the effects of hyper-consumerism as an ecological footprint, the consumers of First World countries – according to Rees – use four times more resources than they should. Free market competition provides tools that allow wealthy people to get much more than a balanced, fair distribution allows. Another educational issue is: at whose expense do wealthy people use more resources than they should? Why, at the expense of animals, all of nature, and at the expense of the inhabitants of Third World countries and the future generations. According to the data of the World Wide Fund for Nature (WWF) from 2015, we require 2.7 gha/person, yet we currently have 2.1 gha per person. The largest ecological footprint is found in the USA and China, with 9 gh in the US and only 2.11 in China. Poland is ranked 33rd with a footprint of 4 gha with a biological capacity of 2.1 gha. Finland (7.64 gha) and Sweden (6.07 gha) have the heaviest footprint in Europe. Whereas such countries as: Congo, Malawi, Haiti, Nepal, Bangladesh have 0.5 gha per person. It is worth noting that sustainable development can only be ensured if a country meets two criteria: the ecological footprint is less than 1.8 gha and the human development index (HDI) is higher than 0.8. These data are often approximate and change constantly, which is connected with the current consumption policy of the government of a given country in a given period of time.

To sum up, only the inhabitants of affluent countries participate in hyper-consumption, due to which over one billion people are overweight, i.e. with the largest (visible) ecological footprint and also the smallest ethical footprint. The population of malnourished people is just as numerous, because it is at their expense that over a billion of obese hyper-consumers live. In the second decade of the 21st century, the individual ecological footprint of a wealthy country inhabitant amounts to as much as 6 hectares of land with its resources, yet they are rightly entitled to no more than 1.5 hectares. The inhabitants of poor countries also use about twice as much natural resources than a safe number, since we all equally exploit the so-called natural capital that has been accumulating over millions of years of evolutionary time. Regardless of where and how we live, we sustain our existence by over-exploiting biodiversity. We deprive other species of their food sources, destroying forests, depleting the oil reserves, minerals, soils, and at the same time often do not have basic knowledge about the exploitation we carry out. Although this does not diminish our responsibility, we often unconsciously deny other organisms access to habitats and energy. Perhaps clear and thorough ecological education will minimize the acceptance of an

extractivist attitude towards the world, as such an attitude will not be a stereotypical habit, but a deliberately immoral choice. It seems that the role of humanists is to show the paradox that humanity is nowadays much more dependent on nature than in the past, because the survival of affluent countries has never been so much conditioned by the biosphere's stability. Therefore, the challenge for humanists is to overthrow the myth of anthropocentric species chauvinism, not only in the area of science but also in the broad sense of consumerism.

Conclusions

As humanity, we believe that we are separate from nature, when in truth we are the most powerful, most expansive organism, consuming every type of ecosystem. We consolidate the myth of civilization gradually disconnecting from nature, which is an economic nonsense. The answer to the anthropocentric conceit and its consequences – solastalgia and the extractivist attitude – may be education regarding one's own individual ecological footprint. Eco-education should result in clear knowledge that the price for our existence is obtaining all kinds of means to live, that is, to consume a bioproductive plane of raw materials. In other words, the existence of being-in-the world of a human individual is a synonym of the inevitable vital dependence on the environment, which took the form of a predatory, parasitic devastation. Such a destructive-parasitic realization of being-in-the-world would mean that *Homo sapiens* should actually be referred to – as John Gray preached – as *Homo rapiens* (Tallis, 2011, p. 148). The task of environmentally-oriented educators is to raise awareness that the modern world of the technology and information revolution and its inhabitants are a product of primitive fossil fuels. Each of us has the right to participate in the same plane of the planet's productivity – 1.7 hectares per person. There are no privileged individuals here, who due to inherent or acquired traits become favored in access to natural resources. People are equal in terms of their right to live and the right to sustain their life at the expense of nature. In other words, we are not only equal in the face of death and observance of the law, but also in the face of the availability of common natural wealth. Meanwhile, our right will end with drastic climate change or depletion of available resources, which is already happening. In the face of a catastrophe, the pedagogical-existential task is to move from anthropocentric conceit to biocentric humility, where humankind will understand itself in the form of a subset of the larger ecosphere. Otherwise, we are threatened by exceeding many critical points at once and a spectacular cataclysm.

Forecasts

The problem is that unreflective submission to the consumer's imperative of increasing one's comfort of life does not allow us to recognize and experience nature emotionally. A person with an extractivist attitude will not protect something they do not respect and perceive only in the criteria of hostility and conquest. The more we isolate ourselves linguistically and mentally from nature, thus cementing our anthropocentrism, the more we move away from the superhuman, interspecies values of responsibility, respect and care.

Once they grow up to be adults, our present newborns will never witness coral reefs or the Arctic ice – these will only be a memory. Desert ecosystems will enter southern Europe, North Africa, the western US and the Amazon, India, and western China. Decade by decade, we will all have to adapt to the desert world, just like to the greenhouse gas emissions. When today's newborns become old people, with the continued burning of fossil fuels at a rate observed in 2018, the climate will already be warmed by 3 degrees Celsius. Perhaps these people will view the people of the twentieth century as the greatest pests that had ever existed among the human race. The twentieth century residents seem to be cursed with indifference and greed, which will not help stop the global warming. This ignorance, indifference and greed makes us irresponsible and even insane when it comes to endangering future generations of people and the entire nature in the 21st century. Today's cynical denialism, which downright rejects scientific warnings of an impending cataclysm, can be described as insane.

In the face of visible indifference, we must trust educators that their local activities have a chance to transform into global actions to save the Earth. Starting from an ecological footprint, through an ethical footprint, the last step may be a social footprint in the form of ecologically friendly technologies, e.g. the widespread use of renewable energy sources. This way, successive generations have a chance – thanks to the ongoing commitment of pedagogues – to overcome the inborn frailty of *Homo sapiens*.

References

- ALBRECHT G., The age of solastalgia, in: *The Conversation*, <http://theconversation.com/the-age-of-solastalgia-8337> (20.02.2018).
- BALCH O., 2015, Indonesia's forest fires: everything you need to know, in: *The Guardian*, <https://www.theguardian.com/sustainable-business/2015/nov/11/indonesia-forest-fires-explained-haze-palm-oil-timber-burning> (15.03.2018).
- BAMBER J. L., RIVA R., E. et al., 2009, Reassessment of the Potential Sea-Level Rise from a Collapse of the West Antarctic Ice Sheet, in: *Science*, 324(5929), p. 901-903.
- BUCCI K., ROCHMAN Ch., Beyond our oceans: Microplastics pollute rivers and lakes too, in: *The Conversation*, <https://theconversation.com/beyond-our-oceans-microplastics-pollute-rivers-and-lakes-too-94559> (30.04.2018).
- DIAZ H. F., HOERLING M. P., EISCHEID J. K., 2002, ENSO variability, teleconnections and climate change, in: *International Journal of Climatology*, vol. 21, issue 15, p. 1845-1862.
- DÜRRENMATT F., 1986, *Labyrinth. Stoffe I-III*, Verlag, Zurich.
- FU R., YIN L. et al., 2013, Increased dry-season length over southern Amazonia in recent decades and its implication for future climate projection, in: *PNAS*, 110(45), p. 18110-18115.
- GREGORY J. M., HUYBRECHTS P., RAPER S. C., 2004, Climatology: Threatened loss of the Greenland ice-sheet, in: *Nature*, 428, p. 616.
- HASHIMOTIOA T., KOJIMAB K. et al., 2000, Changes in carbon storage in fallow forests in the tropical lowlands of Borneo, in: *Forest Ecology and Management*, 126(3), p. 331-337.
- HOEGH-GULDBERG O., MUMBY P. J., et al., 2007, Coral Reefs Under Rapid Climate Change and Ocean Acidification, in: *Science*, 318(5857), p. 1737-1742.
- JOHANNESSEN O. M., BENGTSSON L. et al., 2004, Arctic climate change: observed and modelled temperature and sea-ice variability, in: *Tellus*, 56(4), p. 328-341.
- KLEIN N., 2014, *This Changes Everything. Capitalism vs. Climate*, Simon & Shuster, New York.
- KLEIN N., Walczmy, zanim wszyscy trafimy przeżuci na halde, in: *Krytyka Polityczna*, <http://krytyka-polityczna.pl/swiat/klein-walczmy-zanim-wszyscy-trafimy-przezuci-na-halde/> (16.03.2018).
- O'BRIEN K., LEICHENKO R. et al., 2004, Mapping vulnerability to multiple stressors: climate change and globalization in India, in: *Global Environmental Change*, vol. 14, issue 4, p. 303-313.
- PHILLIPS O. L., ARAGÃO L. E. et al., 2009, Drought Sensitivity of the Amazon Rainforest, in: *Science*, 323(5919), p. 1344-1347.
- REES W., WACKERNAGEL M., 1996, *Our Ecological Footprint: Reducing Human Impact on the Earth*. New Society Publishers, Gabriola Island.
- SCHALTEGGER S. et al. (ed.), 2015, *Corporate Carbon and Climate Accounting*, Springer International Publishing, Switzerland.
- TALLIS R., 2011, *Aping Mankind. Neuromania, Darwinitis, and the Misrepresentation of Humanity*, Routledge, London and New York.
- ULANOWSKI T., Wielka Pacyficzna Wyspa Śmieci jeszcze większa, niż myśłano, in: *Gazeta Wyborcza: Nauka*, http://wyborcza.pl/7,75400,23169673,wielka-pacyficzna-wyspa-smieci-jeszcze-wieksza-niz-my-slano.html?utm_source=SARE&utm_medium=email&utm_campaign=wieczorny (28.04.2018).