Environmental Problems Globally

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1. Auflage 2016. Taschenbuch. 256 S. Softcover
ISBN 978 3 631 67347 8
Format (B x L): 14,8 x 21 cm
Gewicht: 340 g

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From Perception to Reaction

PL ACADEMIC RESEARCH

Introduction

The study of environmental attitudes and behavior is a multifaceted undertaking that can be and has been approached from various perspectives in different disciplines. However, the perspectives are not alone in having many angles; environmental attitudes as well as behavior are multifaceted constructs, to express it in technical terms. This might very well be true for most attitudinal issues. Therefore, studying these issues poses a challenge for the researcher in terms of coping with this complexity adequately. Research articles in peer reviewed journals, however, often do not offer sufficient space to deal with all the intricacies of environmentalism. Consequently, much of the work done in environmental sociology, psychology or behavioral economics usually provides insight into only one particular portion of the whole story.

The present study aims at an extension of the state of research on the one hand, investigating aspects of environmentalism that research has so far neglected. On the other hand this study tries to bring together explanatory approaches that might well complement each other to get a fuller understanding of what drives people to be more (or less) environmentally concerned or to engage more (or less) than others in environmentally protective activities.

As this study is practically oriented, the first part (chapters 1–2) introduces the broader framework in which the present study is embedded and will clarify the practical relevance. It will give an explanation of what environmental pollution, degradation or pollution actually mean and which role human beings adopt as socio-economic, legal or political actors with regard to the environment. Without an understanding of the complexity of environmental problems and the human-environment connection it is difficult to draw practical conclusions from this or any other study. The role that people are expected to play, i.e. that of responsible citizens, can only be normative to a certain extent. Nonetheless, the first part of this study tries to proceed as analytically as possible.

The second part (chapter 3) ties in with this previous point, starting with a discussion of the theoretical background. The constructivism perspective explicitly needs reference to the intricacy of environmental problems. This helps to form theoretical explanations about why the (social) construction of the area "the environment" may be perceived and thought of so differently by many people. The second theoretical approach consists of a rational choice perspective. It then proceeds by helping to explain how the subjectively constructed reality, as consumer, parent, employee or employer, or as an actor within the legal system, comes to

make a behavioral decision. How do our perception, our social positions and world views influence a particular choice made between multiple potential forms of action? Are values, beliefs or convictions what drive us? Or instrumental utilities which we pursue? Or a combination or interplay of both of these? Do we shift our attention to certain activities while others remain ignored, irrespective of the actual environmental impact? Do we use high-, medium- or low-cost activities to express our environmental concern? Are we active at all?

These theoretical questions are then investigated in the third part (chapter 4–8). The third part might be termed 'the empirical'. This includes a description of the data used and the methodological approach pursued (chapter 4). An additional focus is put on data quality assessment, in particular on the question of whether missing values compromise the data set and if the scales that are supposed to measure environmental concern are comparable across the different countries. This also includes a short investigation of possible response pattern biases as well as how missing values are dealt with. In the third part the operationalization of the dependent and independent variables is described.

After this technical section, chapter 5 continues with the substantive empirical analysis. First, a cross-national comparison at macro level will show that there are indeed differences concerning the perception of the environment as well as the level of environmental concern and action between countries. A detailed microanalysis of six selected countries provides insights into how far the theoretical assumptions discussed in part two substantially contribute to explaining environmentalism in the respective country.

Finally, a summary of the findings pointing out similarities and differences between various aspects under the microscope as well as country differences will follow. Further research suggestions in addition to practical implications with reference to the first, second and third part will serve to complete the study.

A preliminary note on the terminology of this study has to be made before starting with the excursus on environmental problems. The term 'environmentalism' will be used throughout the study. To avoid misunderstanding, the expression should be understood neutrally. No political meaning is implied. The term is simply used to refer to both environmental attitudes and environmental behavior.

An Excursus: Environmental Problems

To understand the relationship between the environment and society completely, from perception to reaction – if this is possible at all – one has to take a look at what is actually meant when speaking about pollution and environmental problems. In everyday language it is often used in a rather vague way without any specificity. Research papers in the social sciences often do so as well. The purpose of this chapter is to provide insight into the complexity of what can be found behind the concepts of pollution and environmental problems. Especially when investigating people's attitudes and behavior toward preventing pollution, it has to be kept in mind that pollution may have different definitions, not only from country to country but also between individuals. A few questions from the 2010 module of the International Social Survey Programme (ISSP), the third wave about the environment, may introduce the issue:

International Social Survey Programme 2010:

Q9c: Modern science will solve our environmental problems with little change to our way of life.
Q12a: How willing would you be to pay much higher prices in order to protect the environment?
Q13a: It is just too difficult for someone like me to do much about the environment.
Q13e: Many of the claims about environmental threats are exaggerated.

These four questionnaire items mention environmental problems, environmental protection, uncertainty about doing something about the environment and environmental threats. Do people think about throwing away a piece of paper or spilling oil into a river when pondering environmental problems? Is reducing people's energy consumption or donating to or actively participating in environmental protection groups when environmental protection is addressed? Do people consider environmental pollution and problems to be the same? These kinds of questions can be understood in diverse ways, "because different countries face different environmental problems and interpret the question differently" (Israel and Levinson 2004, p. 10). Consequently, results from survey data using such general statements should be construed carefully.

The following sections will depict what can be understood when speaking of pollution and environmental problems. This is necessary to comprehend the problems human societies face when trying to protect the environment. It might be an encouragement or motivation for further survey designs to go into further detail when addressing the issue of environmental pollution and protection. This chapter

is also an aid for readers to get a better understanding of the issue which can be kept in mind and recalled when necessary throughout the reading of this study.

What is environmental pollution?

Pollution is "the introduction into the environment by humans of substances that are harmful or poisonous to people or ecosystems" (Perk 2006, p. 4). This anthropocentric definition can be complemented in a more general way: "a pollutant is a chemical out of place" (Hill 2004, p. 3). Accordingly, pollution does not only have man-made sources. Imagine the ash, chlorine, sulfur dioxide etc. emitted in a volcanic eruption. However, when speaking about pollution or preventing pollution, usually, anthropogenic pollution is addressed.

The following information is taken from Hill (2010) "Understanding Environmental Pollution", chapter one. The chemicals that are out of place are repeatedly a result of human activities. They become harmful when building up to dangerous levels, i.e. with increasing concentration of a chemical in the place the usually do not belong. They are often not harmful in the place where they belong unless the dose (i.e. the amount that is emitted) becomes higher than the place can tolerate. They can also be harmful in lower doses when moving to a place they do not belong. The typical anthropogenic sources of pollution are: transportation, refineries, manufacturing facilities, production of electricity and heating, agriculture including fertilizers, mining, forestry (deforesting), construction and building, preparation of drinking water and sewage and waste disposal.

The author emphasizes that pollution is aggravated by deliberate or careless behavior as well as poor technology. Without deliberate or careless pollution it would nevertheless still exist as no process is 100% efficient. Even when breathing we emit carbon dioxide; the question is, when is a chemical a pollutant and when not.

Pollution or not?

The greenhouse gas carbon dioxide CO_2 is often referred to as a major pollutant contributing to global warming. CO_2 per se is not a pollutant. Without any CO_2 in the atmosphere the global average temperature would be approximately 35° C lower than it is today (Hill 2010, p. 170, Lomborg 2007, p. 9). Considering that the global average temperature of the 20th century was 12.1° C (U.S. National Climate Data Centre 2011), life as we know it would barely be possible with an average temperature of about 20° C below zero.

In general, it can be said, that almost anything can be a pollutant if the dose is high enough, the location of pollution is vulnerable to it or the exposure to the

pollutant lasts long enough (Hill 2004, Perk 2006). "Milk, fruit juice, and sugar, for example, are generally not considered as pollutants, but if directly released into surface water they are harmful to aquatic life, since the oxidation of the organic substances depletes dissolved oxygen into the water" (Perk 2006, p. 7).

First, two different types of pollutants have to be distinguished: Primary pollutants are substances that are harmful in the form they are released, secondary pollutants become harmful as a result of a chemical process (Perk 2006, p. 5). Additionally two general types of pollution sources need discrimination (Perk 2006, p. 8): Point sources occur in a single location and their effects are direct and local. Point sources are usually easy to identify, easy to control and easy to trace back to their cause. Diffuse sources are less straightforward to identify, as they occur over a wide area. They come into effect at a distance from their cause and often originate from several causes and include several substances, some of which might not be harmful on their own. They cause systemic harm. As a consequence, diffuse sources are hard to control and tracing them back to their cause is usually barely possible, although it might be possible in some instances. Point sources have local effects while diffuse sources have systemic effects (Hill 2004, p. 26). These two types of pollution sources cannot always be distinguished as sharply as the definition does. A local oil spill will have its most adverse effects where it takes place but as oil seeps into the ground and moves it can cause systemic effects too, distant in time and place.

Hill (2004, pp. 12–13), furthermore, describes two general characteristics of pollutants: pollutants move and pollutants change form. The adverse effects of pollutants are aggravated (or alleviated) by the ability of the place into which they are released to retain or to transport them as well as the pollutants' capacity to be retained, transported or change form (Perk 2006, p. 5). Chemicals are released into air, water or soil and while causing local effects they move through or with the respective medium. Thus, toxic waste spilled into a river (point source) can severely harm the local aquatic ecosystem but as it moves with the water downstream water and shores along the whole current of the river can be harmed as well (diffuse source). Although the most adverse effects of a chemical are usually local ones (primary pollutants), distant effects can also be strong, for example when the chemicals react with other chemicals found in other places (secondary pollutants). Similar scenarios can be imagined for air and soil "transportation" of pollutants.

From pollution to an environmental problem

Environmental pollution and environmental problems are not synonyms. Pollution becomes problematic when the place or system into which it is introduced

is harmed by it so that its metabolism can no longer handle the substance(s). In general, environmental problems are problems of metabolism (Huber 2001) where the system's functions are disturbed. There is a limited capacity of ecosystems, and "contemporary 'ecological limits' refer to the finite ability of the global ecosystem to provide its vital services in the face of an increasing human load" (Dunlap 2010, p. 18). Emissions from the combustion of fossil fuels are absorbed and metabolized by natural sinks like forests and oceans; other substances are degraded as a natural service of microorganisms (Hill 2004, p. 13). Gases like carbon dioxide CO_2 are for example metabolized in photosynthesis. If the dose of these gases increases it takes longer for the sinks to metabolize them; they persist in the atmosphere for a longer time and humans, plants and animals are exposed to them for a lengthier interval, which can be harmful for them. Bell et al. (2011), for instance, show that diesel vehicle emissions can stimulate and reduce the performance of plants (e.g. number of dead leaves or photosynthesis). These stimulations or reductions "can all be viewed as having potential adverse ecological impacts" (Bell *et al.* 2011, p. 1990). The longer the plants are exposed, the more harm is caused. Additionally, more chances for other chemical processes are provided when chemicals last longer in one place. Nitrogen oxide NO_x can react with hydrocarbon $C_nH_{(2n)}$ (which are both emitted by combustion of fossil fuels) catalyzed by sunlight to ozone O_3. Ozone in turn is a toxic substance[1] to humans and non-humans (Sinha and Singh 2010, p. 6); or fine particulates emitted during fossil fuel combustion could concentrate in the air and cause acid rain. An overdose of a chemical that is degraded by microorganisms or via photosynthesis can harm the organism or plant and thus reduce their natural service capacity or destroy them entirely. Then, the service is no longer available at all, which in turn has consequences for the whole ecosystem. This can be local when a pond turns over and affects the local ecosystem or global when climate warms and thus affects the entire world (cf. Hill 2010). However, there is often an accumulation of such "local-scale forcings", as labeled in the natural sciences, from which "global-scale forcings" materialize (Barnosky *et al.* 2012, p. 54). For example, many local sources of CO_2 emissions contribute to global warming. These global forcings can, of course, affect local systems in return.

Effects of pollution, degradation or destruction not only can lead to worse conditions of the ecosystem or entail direct negative health effects, as thus far

1 That a harmful chemical is not harmful in any place where it occurs can be shown by the example of ozone. In the troposphere it is a pollutant dangerous for humans. In the stratosphere it is a proctectant as it absorbs dangerous UV rays from the sun (Hill 2010, p. 122).

described, but can also cause a so-called critical transition or state shifts. These result from "bottom up (local-to-global) and top-down (global-to-local) forcings" (Barnosky *et al.* 2012, p. 57). In the "state shift theory" (Barnosky *et al.* 2012) two distinct effects can cause such a state shift (e.g. turnover of a pond). First, the condition of an ecosystem is influenced, for example by pollution, slowly over time until a threshold that is hard to anticipate is crossed and causes the ecosystem to shift abruptly from one state to another. Second, there is a 'sledgehammer' effect (Barnosky *et al.* 2012, p. 52), a particular action (the authors name the clear felling of a forest with bulldozers) which ends in a not surprising and also very abrupt state shift. After this state change "it is extremely difficult or even impossible for the system to return to its previous state" (Barnosky *et al.* 2012, p. 52).

When pollution and environmental problems are addressed in the subsequent chapters of this work, the complexity that leads from a mere chemical to an environmental problem, their point and diffuse sources, and their route from local effects to global (systemic) effects and back, has to be kept in mind. This is particularly important from the constructivist's perspective where environmental problems, despite their objective matters of fact, are perceived and evaluated differently depending on knowledge, information, social interaction or ideologies. Imagine by what extent the answers to the survey questions at the beginning of this chapter may differ when they are answered before or after reading this chapter. The complexity and the fact that much of the world's environmental pollution and the resulting problems are caused by an accumulation of consequences of human behavior is a first answer to the question that will be addressed in more detail in the next chapter: Why conduct studies on individual environmental behavior?