
Population theory and human ecology

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I. OBJECTIVE

The postulate of this contribution is that the central topics of demography and of human ecology are essentially the same and can be separated only artificially. The fact that population growth is one of the decisive determinants of the ecological crisis is the basis for this view. But there is another good reason: every important scientific problem has an ethical dimension. This is especially true for population theory and for human ecology. In the ecology ethical debate has led to two diametrically opposed positions, those of "spaceship ethics" and "lifeboat ethics". Both concepts use arguments from population science, a fact which strengthens the close connection between population science and human ecology. "Spaceship ethics" draw a parallel between the situation on earth and that in a space vehicle, which depends upon solidarity among its crew for its continued existence. The viewpoint represented corresponds to those of one of the classic scholars of demography, J.P. Süßmilch. "Lifeboat ethics" propound that the continued existence of mankind is best guaranteed if the rich nations of the world, already sitting in a seaworthy lifeboat, leave the rest to their fate swimming in the water. "Lifeboat ethics" also find correspondence in classical population theory, namely in the "Principle of population" by Th.R. Malthus.

The objective of this paper is to analyse the historical and epistemological connections between population science and ecology and so to contribute towards achieving interdisciplinary discussion and co-operation on the subject at hand.

II. THE COMMON ORIGINS OF POPULATION THEORY AND HUMAN ECOLOGY

1) Initial Methodological Remarks

The ecology has only recently become a matter for public discussion. This started in the seventies of this century as the effects of world-wide environmental pollution became known. The expression "ecology", however, has been in existence for 125 years. It was introduced in 1866 by the German zoologist Ernst Haeckel: " ... with 'ecology' is understood the whole science of the relationships between organisms and their surrounding environment, to which can be counted their 'conditions of existence' in a wide sense" (Haeckel, 1866: 286).

Much older than the definition of ecology as a science are real ecological problems. It is the general opinion that ecological problems first occurred in connection with the industrial revolution and the creation of modern industrialized societies, but in fact they are so old as mankind itself. Although some natural peoples lived in balanced harmony with nature for hundreds or thousands of years, others changed natural conditions to a significant extent. The aboriginal inhabitants of Australia, for instance, converted the forested areas into prairie and even desert through systematic burning. Upon settling the Hawaiian islands in the 4th and 5th centuries the Polynesians wiped out more than half of the then existing bird species. Another example is that of the Mediterranean landscape. Plato describes ecological problems in pre-classical Greece in his dialogue "Kritias" with the words "... before, when the land was unspoiled, there were hills having a thick layer of soil, as on the plains with their rich soils, which can now only be described as stony. Wood was plentiful in the hills, which can still be seen in some places ... it is not so long ago that the roof beams of great houses were made from these trees ... the land enjoyed plentiful rain which, not as now, was not lost by flowing away over the stony ground, but was taken up and preserved in a protecting layer of clay soils; the water could therefore flow [slowly] from the higher to the lower places feeding springs and streams... in addition came the care paid by farmers, who really fenced and preserved the land, and made it their duty to do so, ..." (Plato, 1988: 196-97).

Haeckel used the term "ecology" principally in connection with plants and animal ecology. The expression "human ecology", which places mankind at the centre of consideration, is found first in the 1920's principally in the areas of human biology, the social sciences, geography, and, of course, ecology. Two social science books with the title "Human Ecology" were published in 1950 in the United States which were principally concerned with aspects of the settlement structure (A.H. Hawley, J.A. Quinn,

1950). Shortly afterwards Eugene O. Odum defined "human ecology" as a boundary area lying between the social sciences and ecology in his mainly natural science orientated book "Fundamentals of Ecology" (Odum, 1953). He described the research field of human ecology as a task only possible through interdisciplinary co-operation. Paul R. and Anne H. Ehrlich took this course in their book "Population, Resources, Environment; Issues in Human Ecology" (Ehrlich a. Ehrlich, 1970) and since then there has been a flood of similarly orientated publications.

The mass media report almost daily on themes of human ecology. News on the destruction of tropical rain forests and the virgin forests of North America, sea and lake pollution, the increasing temperature of the earth's atmosphere, the extinction of species, etc, etc, is being spread in countless articles, books, radio and television programmes, seminars and congresses. Population science is being pulled along by the ever increasing volume of new literature. In the huge flood of news on catastrophes, speculations, doomsday visions and fears about the future, demography – with its quantitative methods of population analysis and forecasting – has the role of a comparatively safe foundation, like a solid raft in a raging stream. The raft provides the basis for the scientific calculation of population growth and thus for the expected anthropological pressure on the world's ecological systems. Thus population science is appearing increasingly as a public issue.

In Germany the complex demography/ecology and demography/economics has been selected as one of the foci of adult education through the mass media. For the winter semester 1991/92 Germany's radio stations broadcasted a series of 30 programmes compiled by an interdisciplinary team of scientists. Some universities and many of the 350 communal adult education centres offered courses parallel to the radio broadcasts. The German Institute of "External Studies" of the University of Tübingen published a didactic text accompanying each programme together with excercises for 18 000 students that will be evalutated by computer (Deutsches Institut für Fernstudien, 1992).

The radio series has the title of "Human Ecology". The subtitle "World Population, Environment, Nutrition" demonstrates that population science occupies a central position in the range of topics presented from the natural and social sciences, economics, ecology and philosophy. Since I was responsible for the area of demography in this project I had to be very clear about the relationships that exist between human ecology and population escience. I have determined three classes of relationships each existing on its own level. The first level consists of the real phenomena of population and economic growth as part of the civilisation process including the resulting socio-economic, demo-economic and demo-ecological problems, to mention only the most important modes in the network of problems resulting. On the second level are the connections between the historical development of the various sciences which consider real problems, for instance , biology, economics, sociology, ecology, statistics and – last but not least – demography. The third level comprises the relationships between the epistemological problems of these sciences. In Popper's ontology the epistemological level belongs to the so-called "World 3", it is

the world of thought, logical statements and timeless mathematical truths (Popper, 1973: 174). The scientific problems of ethics and the logical connections between the scientific problems of various disciplines also belong to this "world 3". The logical relationships between scientific problems must not be confused with the relationships existing between real phenomena on the first level or with the historical connections between the sciences on the second.

In what follows, however, I shall not adhere strictly to the definitions of the three levels – in such a short contribution this is neither possible nor necessary. But there are points, such as the interpretation of malthusian theory, where I consider a clear analysis to be impossible unless differentiation is made between real, scientific–historical and epistemological relationships. The complexity of human ecological questions cannot be adequately discussed in any other way.

The history of real population problems (as part of level 1) and the history of population science (as part of level 2) have run so consistently parallel, and have influenced each other to such an extent, that their presentation can begin either with level 1 or with level 2. Since I am going to confine my considerations of real phenomena to those of the present and of the expected future, I shall put the historical aspects of level 2 first. My treatment of epistemological relationships will be separate and confined to ethical aspects.

2) Human Ecological Approaches and the Demo–ecological Carrying Capacity Analyses in Süßmilch's Population Theory

The usual presentday definition of "human ecology" is very wide: Human ecology is the science of the inter–relationships between mankind (individuals, population groups) and other forms of life as well as between mankind and his influencing environmental factors. This definition – at first glance clear and simple – upon further scrutiny does not resemble a watertight vessel safely enclosing its contents but rather a wickerwork basket. Leakage arises from the expression "mankind". According to the humanist Erasmus of Rotterdam man is not born, but bred. Because human ecology is based on the concept of mankind it has to refer to anthropology which, however, is not a closed field, and consists of historical anthropology, biological anthropology, philosophical anthropology and other sub–anthropologies. The image of mankind presented by biological anthropology was and is more optimistic than that given by social and philosophical anthropology. As a result of anthropological environmental destruction a sceptical, if not a negative, public image of mankind has been created. It is even possible that man's image will be so basically changed by and through his continuing disregard of the environment that radically new values and a re–evaluation of mankind's cultural background will emerge.

How strongly the humanistic interpretation of man as the "pinacle of creation" (Herder, 1784) has already changed can be seen from an historical review. We are now occupied

more intensively than ever before with ecological questions because so many ecosystems are endangered. But Haeckel introduced the term "ecology" in 1866 not in expectation of existent or future ecological crises. The difference between the ecology of the 18th and 19th centuries and that of today is that of the motivation for work on ecological problems. For the demographer and theologian J.P. Süßmilch (1707–1767) the decisive motivation for his principal work was the wonderful harmony and order of nature and of the regularity of the laws governing demographic change. The formulation of his title "The Divine Order in Human Change Arising from Births, Deaths and Reproduction" reflects his impression of an overall and wonderful "order of things". Süßmilch wrote that he received the impulse for his work from the English nature researcher and theologian William Derham (1675–1735). Derham published a book in 1713 with the title "Physico-Theology" followed in 1714 by "Astro-Theology" and in 1729 by "Christo-Theology". Here can also be seen from the titles that Derham wanted to demonstrate the hand of God in the harmonious structures, proportions and relations of animal and plant life just as Isaac Newton had done with his laws of gravity and mechanics of the "heavenly bodies". It was the following from Derham that inspired Süßmilch: "... and by a curious Harmony, and just Proportion between the increase of all Animals, and the length of their Lives, the World is through all ages well, but not over-stored. One Generation passeth away, and another Generation cometh, so equally in it's Room, to balance the Stock of the Terraqueous Globe in all Ages, and Places, and among all Creatures ..." (Derham, 1713: 171).

Süßmilch's contribution to population statistics and demography can be briefly summarized as follows: (1) He analysed the relationships of births and deaths to the population structure on the basis of church records for Prussian communities. From these relationships he derived methods for estimating the population of countries without population censuses. (2) He calculated the male/female relation at birth and defended the empirical value of 106/100 against the hypothesis of Nikolaus Bernoulli (1687–1759) and Abraham Moivre (1667–1754) that on the basis of probability theory the relation should be even at 100/100 and every observed deviation is random. (3) He calculated the differences in the proportions of the sexes according to age groups and analysed their regional disparities. (4) He performed mortality analyses according to the cause of death and, together with the mathematician Leonhard Euler, produced one of the first mortality tables. (5) He investigated regional differences in fertility and also regional and international differences in population growth. (6) Finally, he produced the first realistic forecast of the world's population (7 billion, see below).

Süßmilch's population analyses are a good example for the early ecological and human ecological research. This is particularly apparent in his world population forecast. This was based on an empirical carrying capacity analysis and not, as per Malthus, on theoretical assumptions to the forms of growth of nutritional volumes and population. His demo-ecological analysis demonstrates a search for order and regularity – nowadays we would say for "system mechanisms" or for the laws of homeostasis – and he only

afterwards posed and answered the question of the world's maximum population. Süßmilch placed great value on his observation that mankind can change the natural carrying capacity of the world by means of knowledge and hard work. But he was not a dogmatic "populationist" who implicitly wished to increase the size of the population by all the argumentative means at his disposal. The "laws of order" were for him the most appropriate basis of population growth, not the artificial population measures of the mercantile state. Population growth would come automatically to a halt once the limits of the natural carrying capacity, including the efforts of man to improve it, are reached (Süßmilch, 1765, Vo. 1., p.50). This is in strong contrast to the "Principle of Population" of Malthus who considered that violent "positive checks" such as wars would be necessary to control the growth in population.

In the 17th and 18th centuries every piece of scientific work was seen as contributing to, or against, a proof of the existence of God. Science and philosophy were circling around the questions of whether the god-sent miseries of this world such as wars, disease and natural catastrophies were really necessary and, if so, to what were they good. Süßmilch didn't take on his life's work in demography out of scientific curiosity nor in order to create a scientific basis for his arguments for social policies and reforms to support the poor. The real motivation was to prove the existence of God by demographic means. Süßmilch's demography was a by-product of an attempt to provide an empirical proof of the existence of God. The central questions to the sense and purpose of the calamities of this world were also answered by Süßmilch by empirical demographic means. In the third main chapter of this principal work he reaches the conclusion that such calamities, i.e. including the later malthusian "positive checks", are not necessary and, in fact, are the sole responsibility of mankind itself.

I have made this point here for two reasons. Firstly, because it is highly relevant in our time: modern thinkers are increasingly inclined to the hypothesis that the threatening ecological catastrophies could – with high probability – lead to the destruction of human life on our planet. The second reason is the central role played by population theory as the basis for forecasting population levels and therefore for the prediction of inevitable future catastrophies. This is the decisive problem posed by Süßmilch in his third chapter which has the title "Are war and plague necessary, and how many people can live on the earth?". In this chapter he counters Derham's theological arguments for the necessity of such calamities. He presents the detailed man-land carrying capacity analyses for various contries upon which he bases his world population forecasts. The result is that the world population can and will rise to seven billion, i.e. to approximately ten times the then existing world population of 750 million, before the limits of the carrying capacity are reached, and growth therefore comes slowly to a stop (Süßmilch, 1741: 38). From this he reaches the conclusion"... (from my analyses it is) irrefutable that war and plague are not necessary, and indeed many hundreds of years can pass without these evils and the world will not be too full" (Süßmilch, 1741; 98). 57 years later Thomas Robert Malthus published his "Principle of Population". In the preface we find: "It is an obvious truth,

which has been taken notice of by many writers, that population must always be kept down to the level of means of subsistence; but no writer that the author recollects has inquired particularly into the means by which this level is effected: and it is a view of these means which forms, to my mind, the strongest obstacle in the way to any very great future improvement of society" (Malthus, 1798: 61). Had Malthus read Süssmilch's work? He uses tables from Süssmilch's book without even mentioning the conclusions that Süssmilch derived from them. We don't know whether Malthus ignored Süssmilch's arguments because he couldn't read German, or whether he had the tables translated but not the text. It is, however, certain that the history of population science would have been different had Malthus fully considered Süssmilch's ideas and not simply used his book as a data bank.

3) The Effects of the Malthusian Population Theory on Biology and Economics

Süssmilch's population theory is directly connected with ecological questions, so much so that one can postulate an identity of population theory and population ecology in his work. In Malthus theory there is also a direct connection between the size of the population and the agricultural/ecological carrying capacity; but more important are the indirect connections made with the development of economic theory and – separately – with evolution theory. The indirect effects described are long-term and they are, in fact, increasing in our times in an unexpected way. In the meanwhile one doesn't have to be a prophet to suppose that we will soon be confronted with a renaissance of malthusianism.

This is particularly astonishing since neither of the two basic postulates of malthusian theory has proven to be valid; neither the assumption that food supply increases only arithmetically nor that the lower classes react to improved living and income conditions with an increase in their population growth. These two malthusian postulates were rejected as early as the beginning of the 19th century (Sadler, 1830), and in fact the malthusian "principle of population" was refuted by Süssmilch's work in 1741 even before the theory was propounded. Nevertheless, although the theory – scientifically seen – no longer exists, malthusianism is still very much alive, especially in connection with human ecological problems. Why is this?

The first reason concerns the effect on the theory of biology. In his autobiography and in his diaries Darwin wrote that the "principle of population" gave him the inspiration for his theory of selection, which is the basis for the theory of evolution (Darwin, 1958). There is, in fact, an obvious similarity between the malthusian "positive checks" and the mechanism of selection. This is even demonstrated in the way in which the "principle of population" is formulated: "... nature has scattered the seeds of life abroad with the most profuse and liberal hand. She has been comparatively sparing in the room and the nourishment necessary to rear them. The germs of existence contained in this spot of earth, with ample food, and ample room to expand in, would fill millions of worlds in the course of a few thousand years. Necessity ... restrains them within the prescribed bounds.

The race of plants and the race of animals shrink under this great restrictive law. And the race of man cannot, by any efforts of reason, escape from it. Among plants and animals its effects are waste of seed, sickness, and premature death. Among mankind, misery and vice" (Malthus, 1798; 71–72).

This biological view had significant effects on the theory of fertility which plays a central role in human ecology. Biologists define two types of reproduction strategies of which one, the so-called "r-strategy", has direct reference to Malthus. Primitive forms of life who employ the r-strategy bank on the quantity of their offspring whereas forms with a better developed nerve system rely on the "c-strategy" in which quality of the offspring is given preference to quantity. The "c" here stands for carrying capacity, i.e. these life forms adjust the number of their offspring to the carrying capacity of the relevant ecological systems. In doing this they exercise "reproductive self-constraint". Specialists in quality are the large mammals and birds. Into which class does mankind fall? This question, of course, is rhetorical but nevertheless justifiable because Malthus created his population theory to describe the reproductive behaviour of man, and not of animals. But the malthusian parameter r—signifying the maximum possible rate of reproduction — is used in biology for the reproductive behaviour of the lower forms of life, not for higher forms employing the "c-strategy". Of course, no biologist would maintain that mankind reproduces according to the "r-strategy". But still biologists evaluate the effects of man's reproductive behaviour on ecological systems as catastrophic, even though we reproduce ourselves — biologically seen — on the basis of the "c-strategy"; to quote one of the contemporary German biological anthropologists: "Man has obviously used his intelligence primarily to rapidly continue the old Darwin contest of "survival of the fittest" with increasingly sophisticated cultural and technological means. He has eliminated the factors limiting population size by means of his inventions with ever increasing success and speed, and thereby pushed the "carrying capacity" supporting his own population growth always in an upwards direction. Thus ecological and economic crises and catastrophies were inevitable in the long term. 'That the grandiose ecological success of our species is presenting us, and our natural surroundings, with increasing problems is not a result of abandonment of our natural virtues but because we have followed them almost blindly and consequently' (Markl, 1984). It has to be noted here that the 'natural virtues' named with undisguised sarcasm are in fact the result of billions of years of natural selection and 'survival of the fittest' optimization" (Vogel, 1986: 27/28).

This biological interpretation is not generally convincing and I think it contains a contradiction: if, in fact, the characteristic of the c-strategy is that animals adapt more successfully to the ecological carrying capacity the more highly developed they are, then why should specifically man, without doubt the most highly developed animal, be in the position of not being able to apply the c-strategy to such good effect as lower animals? If artificial interference in the human ecological balance is causing the crises then mankind

can correct the mistakes, or at least those that have not already led to irreversible ecological damage.

The second reason for Malthus becoming more actual in human ecology lies in the effects of his population theory on the development of the economic sciences. Malthus himself was one of the founders of classic economics. His supposition that wage increases above the minimum existence level are impossible in the long term because the birth rate and therefore also the supply of labour thereby increases, was adopted by Ricardo as a basis for his classical wage theory. The scientific standing of Malthus' main economic publication, the "Principles of Political Economy" is far higher than his extremely polemic "Principle of Population", which he conceived as a political challenge and published anonymously. Nevertheless, the effects of his "Principle of Population" on economic theory were highly significant in that they contributed to widening the division between the liberal british and socialist german, or continental, schools of economic theory. Karl Marx and Friedrich Engels were well aware of the analogy between the selection mechanism of "positive checks" in population growth and the selection mechanism of economic competition which pushes the weakest off the market (Engels, 1974: 501). The close intellectual ties between economic liberalism and malthusian population theory compelled Marx and Engels not only to damn the population theory but also to propose a social utopia opposed in the extreme to the liberal position.

In our century the division of economic theory into a liberalistic and a socialistic branch induced a polarization in the economic theory of international development and ideologization of aid policies. This has caused difficulties in the realization of international aid programmes for the Third World and in many cases has blocked it completely. As to economic theory itself, after the changes in eastern Europe it remains to be seen whether socialist ideals actually belong to the past or not. It is also possible, even probable, that critical ecological conditions will lead to a revision of liberal economic theory. The first signs of this have already been provided by reforms in methods of calculating the social product. For instance, in Germany the national accounting system is planned to be extended to an "ecological accounting system". A fitting phrase is provided by U.v. Weizäcker (1989: 143): "Prices have to reflect the ecological truth". This "ecological truth" might well lead us to a new "economic truth".

III. EPISTEMOLOGICAL ASPECTS AND THE PROBLEM OF ETHICS

1) Epistemological aspects

Not many demographers know that the further development of the malthusian population theory took place within the framework of the economic sciences and not that of demography. This occurred because classical economics gave way to the neoclassic in which the model of static equilibrium developed into one of dynamic equilibrium growth (Solow, Harrod and Domar). In the static model population was a stationary variable, in

the neoclassic model of "equilibrium growth" and in the Harrod–Domar–model the population grew geometrically with the social product and other principal variables of the national economy.

The change of paradigm is revolutionary from the viewpoint of population theory. The model of "equilibrium growth" is in direct contrast to the "Principle of Population". The sense and purpose of Malthus' "Principle" was to prove that a geometrically growing population must lead to economic and moral breakdown in a society. The neoclassical growth model, however, demonstrated that technical advance allowed a continuous increase in per capita income, even when the population grew geometrically. The neoclassical economists therefore maintained nothing more or less than that steady growth in prosperity was possible for decades, if not for centuries. The idea of perfected material and social living conditions had already been propagated in the course of the French Revolution by the social revolutionists Godwin, Condorcet and others. In the subtitle of the first edition of the "Principle of Population" Malthus named Godwin and Condorcet as the principle addressees of his theory. His objective was to destroy the postulate of everlasting ideal conditions using demographic methods. All he in fact achieved was the opposite: the economists refuted Malthus by theoretically demonstrating the possibility of the existence of permanent improvement in economic living conditions, and the actual economic growth supported them, the biologists also defied Malthus by recognizing the "positive checks" of population as a mechanism effecting improvement in biological existence conditions through the selection principle.

Malthus therefore instigated developments in the economic sciences and biology which were the opposite of what he intended. Something similar happened in political economics through the reactions of Marx and Engels. Only in population theory do I know of no consequences comparable to those that took place in the theories of evolution and economics. But this could still occur, even if very late, if population theory is revised. A re-examination of population theory in connection with global ecological problems is becoming important; it would indeed be very dangerous to advocate solutions to the environmental crisis that are based on a population theory whose validity is dubious.

This principally concerns the so-called theory of demographic transition. The micro-economic theory of fertility can also be doubted. But I do not wish to comment on this theory here since macro-demographic statements and projections of population growth based on micro-economic arguments do not exist. There is more criticism of the transition theory from outside demography than from within; the state of being a theory at all is being questioned because it is too descriptive and because the decisive characteristic of a theory, the existence of a core of theoretically relevant, non-trivial statements and hypotheses, is missing. Gerhard Mackenroth further developed the theory of demographic transition in a sound way in his book "Population Science" ("Bevölkerungslehre"), and one can say much the same of Landry (1934), but, as Mackenroth admits, the decisive theoretical core is missing (Mackenroth, 1953: 328–9).

Whatever one thinks personally about such theoretical questions it remains a fact that those departments of the United Nations, the World Bank and other organisations responsible for producing world population forecasts receive little help from population theory in making assumptions on future changes in fertility. I myself as a forecaster have tried to improve this awkward situation by developing a theory of fertility for industrialized countries (the "Biographical Theory of Fertility") which serves to provide a justification for forecasting assumptions which is lacking in the theory of demographic transition (Birg, 1987, 1991a, b). The essence of my deliberations can be summarized briefly as follows: Firstly, the low level of fertility in developed countries is not a temporary phenomenon but a permanent, unavoidable although unwanted consequence of the economic, social and cultural processes of development which, in the industrialized countries, has led to a continuous increase in the freedom of biographical choice, and – as a result – to a correspondingly continuous decline in the willingness to enter into long-term biographical commitments in the form of marriage and/or having children. Secondly, in those countries which are not yet fully developed but which are following a route leading to the western form of development, in which individuals have legal, cultural as well as material freedoms of biographic choice, a similar decrease will occur. Such countries could be, for example, Thailand, Indonesia, Mexico and Brasil. Lastly, in those countries remaining below a critical level of development in which the individual implicitly has no freedom of biographic choice, there can also be no satisfactory freedom of choice with respect to fertility. In such countries the effective logic of biographical decision in the western democracies – a minimization of the risk elements in long-term commitments – cannot apply and result in voluntary relative childlessness, and so to a decrease in the net reproduction rate to a value of one, or less.

The intensity of world population growth depends critically upon the share of Third World population existing. At the moment nobody can say how large this is. The longer a large part of the world's population belongs to this critical category the more probable it is that the total population will exceed – even considerably exceed – the presently discussed stationary endpoint of eleven billion.

2) *"Spaceship Ethics" versus "Lifeboat Ethics"*

A fundamental experience derived from the history of philosophy is that everyone who deliberates upon a problem of a certain level of complexity has to decide between two viewpoints, or "noting systems" as Henri Bergson said, namely between the viewpoints of realism and idealism. The history of population theory is a good example of this experience: on the primary level are the real problems; the historical changes and the transformation of the basic ethics of human reactions are their consequences. In spite of the fundamental implications that practical ethics have had for human behaviour there has been little progress in the theory of ethics in the course of the history of philosophy. The British philosopher Bernard Williams probably correctly maintains that there are only about five books which contain something new to the theory of ethics, whereas the

number of publications in which this small basis has only been repeated and varied is countless. A large part of the literature of demography is among the countless, and I would go so far as to maintain that its classics, Süßmilch's "Divine Order" and Malthus' "Principle", are essentially theories of ethics in which the science of demography plays a secondary role (Birg, 1990). How important the ethical influence of demography in fact is, can be seen from the paradigm conflict of human ecology or ecology whose opposing positions are represented by "spaceship ethics" on the one side and "lifeboat ethics" on the other, exactly as represented by the two classical theories.

The expression "spaceship ethics" comes from a short, but extremely important, article by Kenneth E. Boulding. Boulding explains the meaning of his metaphor with: "The closed earth of the future requires economic principles which are somewhat different from those of the open earth of the past. For the sake of picturesqueness, I am tempted to call the open economy the 'cowboy economy', the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic and violent behaviour, which is characteristic of open societies. The closed economy of the future might similarly be called the "spaceman" economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material forms even though it cannot escape having inputs of energy. The difference between the two types of economy becomes most apparent in the attitude towards consumption" (Boulding, 1966: 9).

After this was published in the sixties came the Club of Rome discussion of limited world resources. A certain relaxation then followed and the official opinion of the United Nations is presently that: "It no longer seems likely that we will run out of minerals or sources of energy. Known reserves of most minerals have increased, not declined, with time and use. Exploration and new technology have opened up new sources" (Nafis Sadik, 1990: 10).

In place of the global reserve problem then came the environmental problems, destruction of the rain forests, pollution of the seas, and lakes, rivers and groundwater, the extinction, and so removal from the evolution process, of certain biological species, the climate problem, and many more. In answer to the question "what has posterity ever done for me ..., why should we not maximize the welfare of this generation at the cost of posterity?" Boulding gave an answer which simultaneously provides a definition of the expression "ethics": "The only answer to this, as far as I can see, is to point out that the welfare of the individual depends on the extent to which he can identify himself with others, and that the most satisfactory individual identity is that which identifies not only with a community in space but also with a community extending over time from the past into the future" (Boulding, 1966: 11).

Boulding's position is that described nowadays by "spaceship ethics". One could speak of an "unavoidable common interest" between all populations of the earth. The expression "unavoidable common interest" makes it clear that "spaceship ethics" are the result of the existence of real problems and thus correspond to a position of philosophical realism. Boulding actually used the metaphor "spaceship earth" and not "spaceship ethics". This is understandable in that Boulding's ethical position is valid not only for closed systems like the earth but also for open systems. If it should be that one day we learn how to tap the energy of the sun the earth would no longer be – at least in this respect – a closed system, but this would not alter Boulding's ethical position in the slightest.

The term "spaceship ethics" was introduced by the biologist Garret Hardin to characterize Boulding's position and in particular to differentiate the "spaceship ethics" from his own which he described as "lifeboat ethics": "Metaphorically each rich nation amounts to a lifeboat full of comparatively rich people. The poor of the world are in other, much more crowded lifeboats. Continuously, so to speak, the poor fall out of their lifeboats and swim for a while in the water outside, hoping to be admitted to a rich lifeboat, or in some other way to benefit from the goodies on board. What should the passengers of a rich lifeboat do? This is the central problem of 'the ethics of a lifeboat'" (Hardin, 1974; 561). Hardin proposed three alternative courses of action: 1. The boat with the rich rescues everybody and then goes down itself: "complete justice, complete catastrophe". 2. The boat with the rich fills up all the free places regardless of the fact that safety regulations demand that some of them should remain unoccupied. There are then two consequences: (a) Sooner or later one has to pay for not observing the safety regulations. (b) Since there is not enough room for all those swimming a choice has to be made: should the "best" be chosen, or those most in need, or simply those that come first? What does one say to the others? 3. No one is given refuge and the safety factor thus remains. The consequence is that the "survival of the people in the lifeboat is then possible (although we shall have to be on our guard against boarding parties)".

Hardin recommended the third course of action: "... so long as there is no true world government to control reproduction everywhere it is impossible to survive in dignity if we are to be guided by spaceship ethics... without a world government that is sovereign in reproductive matters mankind lives, in fact, on a number of sovereign lifeboats. For the foreseeable future survival demands that we govern our actions by the ethics of a lifeboat. Posterity will be ill served if we do not" (Hardin, 1974; 568). Hardin is a biologist, he quotes Nietzsche who regards having a conscience as a form of "disease". Does Hardin regard eugenics and "Rassenhygiene" as a form of therapy? If so, with this point of view he would find himself in accordance with the well-known bad traditions of German biological population science.

The logic of the argument is: firstly, with our actions we have to consider the requirements of future generations; secondly, because the poor are more numerous and multiply faster than the rich, they impair the rights of future generations much more than

the rich; thirdly, as a consequence ethical principles are best fulfilled if only the rich survive.

The arguments are formally/logically correct, but they have to be rejected because they are based on the false premise that the poor influence the interests of future generations more than the rich. In fact, quite the opposite is true: Although the rich nations (the industrialized countries) comprise only approximately a quarter of the world's population, they produce and consume, for instance, 80% of the commercially produced energy. Because of their high energy consumption they emit triple the volume of carbon dioxide than the underdeveloped countries, and this is responsible for the greenhouse effect. Similar remarks apply to sulphur dioxide, one of the causes of "Waldsterben".

Other authors have already commented this point: "Hardin's statement about saving lives in poor countries is even more applicable to the rich. Every life preserved in the United States threatens the resources and environment of the planet many more times than a life preserved in, say Bangladesh" (Ehrlich and Ehrlich, 1977: 922). I don't want to take this discussion further here, but want to move on to another point, namely that of the epistemological relationship of lifeboat ethics with Malthus' population theory.

The metaphor of the "nature's mighty feast where is no cover for him (the poor)" used by Malthus corresponds to Hardin's lifeboat metaphor: nature has not reserved a place for everybody at this table (Malthus) or in the lifeboat (Hardin). The poor are morally of less worth than the rich because they don't control their sexual urges (Malthus) and therefore overstretch the carrying capacity of the earth (Malthus and Hardin). Thus the rich have a morally better right to survive than the poor (Malthus and Hardin).

The metaphor of the laden table is indicated in encyclopedias as being the typical core of malthusian theory. The decisive piece of text in chapter six of his fourth book, however, has been eliminated in all Malthus editions with the exception of the first edition of the "Second Essay" from 1803. The important quotation is: "A man who is born into a world already possessed, if he cannot get subsistence from his parents ... and if the society does not want his labour, has no claim of right to the smallest portion of food, and, in fact, has no business to be where he is. At nature's mighty feast there is no vacant cover for him. She tells him to be gone, and will quickly execute her own orders, if he does not work upon the compassion of some of her guest" (Malthus, 1803: 531).

The similarity, or even identity, with the lifeboat argumentation goes even one step further: if the rich were to share the lifeboat with the poor for reasons of equity, the boat would fill up with people who do not have such moral scruples, an ethically undesirable consequence. Malthus: "... if these guests get up and make room ... other intruders immediately appear demanding the same favour ... the order and harmony of the feast is disturbed ... the happiness of the guests is destroyed ..." Hardin: "The net result of

conscience-stricken people relinquishing their unjustly held positions is the elimination of their kind of conscience from the lifeboat" (Hardin, 1974: 562).

IV. THE CONCLUSION

In the contest between the metaphors "spaceship", "lifeboat" and "nature's feast" we are not concerned with poetic honours but with a matter of life or death. When Hardin postulates the "freedom to breed is intolerable" (Hardin, 1968: 1243) then this means that he removes the right to live from the majority of mankind since in most developing countries survival without support from children is impossible when sick or old. Satisfactory social support systems are not available. How actual this Malthusian doctrine is in the ecology debate can be seen from remarks such as: "It is a mistake to think that we can control the breeding of mankind in the long run by an appeal to conscience ... 'A bad conscience', said Nietzsche, 'is a kind of illness' ... Freedom to breed will bring ruin to us all ... an appeal to independently acting consciences selects for the disappearance of all conscience ..." (Hardin, 1968: 1246 and 1248).

Derham used a metaphor in 1713 in his "Physico-Theology" which corresponds to the spaceship, not the lifeboat, metaphor; he wrote of the "ball of earth and water" upon which all lifeforms can exist. Süssmilch used the mother metaphor: "The earth can be called the mother of all things, not because she has given all things birth but because that which she does bring forth she upholds and nourishes" (Süssmilch, 1741). At the present time there is neither a material reason nor a moral justification for replacing this viewpoint in the ecology debate with the Malthus/Hardin metaphor and its derived "lifeboat ethics". This should be broadcasted principally by demographers because the ecologists derive their ethical arguments from population science. The species man is still small enough that its members could congregate (albeit not exist) on the island of Mallorca. The population of West Berlin lived for 30 years without any hinterland on an area with 4,200 inhabitants per km², and the majority preferred this life to the easily available alternatives.

The agricultural production potential of the land and water area of the planet suffices to support a population of at least double that of today. The ecological consequences of production and consumption have already led to some irreversible environmental changes but much of the destruction is reversible and is being reversed. Technological advance is making it possible to employ increasingly compatible methods of production. The world could become a fertile garden. In my opinion this is a realistic, not an idealistic, view. We should reject an idealism of the type of the "Principle of Population".

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