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### **Is there an Ecological Marxism?**

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In this lecture I try to show that and how the concept of societal relations of man to nature based on Marxian categories can be used for a better understanding of contemporary ecological problems. Marx himself is ambivalent with regard to the conception of nature in his critique of political economy. On the one hand his theory is related to the traditional approaches of political economy and political theory; he does not leave the traditional “theoretical field” of arguing in terms of political economy in order to open a new one. He follows the signals of rational enlightenment and a “promethean” and logic that takes nature and its limits not into account. The main argument is the following one: Men make their history by means of transforming society, nature and the individual self, but limits of nature do not exist. Therefore nature is conceived as a bundle of resources that can be tapped. The framing of this perspective ranges from Bacon to John Locke’s derivation of property rights (from the capacity of human labour to appropriate the fruits of land) or to the Smithian concept of the division of labour as a source of an ever increasing productivity and thus of the wealth of nations. This theoretical field also includes the Ricardian conception of land as a limiting factor to capitalist accumulation because of the effects of land of lower quality and fertility on the reproduction costs of labour which lead to a declining rate of profit.

The Marxian progress in comparison to Ricardo exactly consists in the interpretation of the fundamental “law of motion” of capitalist accumulation as being shaped by social contradictions and not by limits set by nature. By Marx so-called “vulgar” interpretations of a divergence between the supply of natural resources and the demand of mankind for the products of nature, particularly accentuated in the theory of Thomas Malthus, exhibit an inhuman naturalism, which Marx already in his early writings against German idealism has rejected.

In classical and even more accentuated in neo-classical interpretations of the man-nature-relationship individual rationality of decision-making over *scarce* resources is the central point, contrary to Malthusian thinking where *shortage* is the decisive category. In classical and then neo-classical theory the category of scarcity becomes the centerpiece of economic reasoning. The "methodological individualism" (Schumpeter 1908) has been born and with it a rationality which separates natural resources from not valuable parts of nature which do not serve as a means of capitalist valorisation<sup>1</sup> and then in a next step one natural resource from the other. Otherwise rational decision making would not be possible under the preconditions of methodological individualism.

Thus the holistic totality of nature or its integrity, respectively, is dissolved in an ensemble of individual natural resources and a rest which cannot be valorised or validated. Nature thus is transformed from an ecological into an economical entity; otherwise nature remains "external" to the economic discourse and its rationality. In mainstream economics this assumption on the one hand has the advantage of being appropriate for the application of highly formalised models. On the other hand theoretical reasoning on these grounds has to be aware that externalities, i.e. market failures come in. Thus the theory of external economies and diseconomies has been developed from A. Marshall (1890/1964) to A.C. Pigou (1960) and to R. Coase (Coase 1988). Resource economics (Hotelling 1931) promised to provide rules how to deal with scarce natural resources without damaging the nature, i.e without producing shortage. Therefore paradoxically the rules of dealing with scarcity are conceived as a remedy for the avoidance of shortage (Altvater 1993). Today, the application of the rational rules of decisions under the conditions of scarcity in order to overcome a situation of actual shortage is highly doubtful because of the "limits to growth", the exhaustion of resources and sinks and because of military conflicts on resources ("new wars on resources") in Africa and Latin America and in the middle East. Several wars have been waged on the domination over oil-territories and influences on the oil-price. These events clearly show the limits of pure economics to

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<sup>1</sup> It is difficult to find an english correspondence for the Marxian term „Verwertung“. Some translate it as "validation", others as "realisation" or "valorisation. In spanish or portuguese languages it is easier. "Verwertung" can be translated by "valorización" (or "valorizacao" respectively)

explain reality and the necessity of an approach of political economy for grasping the contradictions of our times. Jean-Paul Deléage concludes: “Moving beyond the limits... and adopting the ‘standpoint of the totality’ is the only methodological choice that can serve as a serious basis for an analysis of the relationship of society to nature” (Deléage 1989: 15)

The dissolution of entire nature into an agglomeration of single natural resources and then the application of a set of analytical instruments based on methodological individualism in order to rationally guide the management of resources, is alien to the Marxian concept of ecological economics. The principal and fundamental reason is the very different concept of socialisation (“*Vergesellschaftung*”). Atomistic individuals, so called *homines oeconomici* who operate in a time- and spaceless and therefore un-natural world of individualistic rationality, are an idealistic construct and have no social relevance. Their construction is an outcome of the “methodological individualism” (Schumpeter 1908) of modern economics. Instead, social individuals are embedded into a historic societal system and dependant on nature and its boundaries. Therefore rationality only can be a socially bounded rationality, and the perspective is the society-man-nature totality. The basic categories of Marx’ critique of political economy with regard to the societal relation to nature therefore are targeted to understand metabolism, i.e. the transformations of matter and energy, the crucial role of human needs, the double character of labour and production, the dynamics of economic and social crises, valorisation of capital, accumulation and expansion (globalisation), entropy and irreversibility. In the following I deal with these categories before coming to a conclusion with regard to the usefulness of Marxian ecology for an understanding of contemporary environmental problems.

### **Metabolism, needs and the double character of labour**

Already in his early writings Marx understood human practice as part of a man-nature metabolism. Human beings have to satisfy their needs and they do that in a social manner, so that the needs of the ones are satisfied by labour of the others - and vice versa: the needs of the others by labour and production of the ones. Needs, therefore, is a central category in Marxian thinking which points at the mutual

character of man's activities in production and consumption in a given society. To hear, to see, to feel, to want, to love – all these “organs of human individuality” are understood as “appropriation” (Marx and Engels in “The German Ideology”, MEW 3), and even the consciousness is socially produced. The needs and the modes to satisfy needs are the basis of the division of labour which also prerequisites mutual acknowledgement of and as social individuals. Marx in the “Grundrisse” remarks that it is necessary to deal with “the system of needs” and with the “system of labour”; but he doubts where to locate the discussion about them (Grundrisse: 427). Because of the mutuality, need must be clearly distinguished from greed, which is need without mutuality, an individualistic endeavour which exhibits a high potentiality of societal self-destruction. For Marx private property is the reason of greed. For, private property has made men so stupid and one-sided, that an object only is understood as “ours”, when men do possess it, when it exists for them as capital (German Ideology, MEW 3). Money is introduced as a mediator between the working producer and the needy individual. Money is the “match-maker between needs and the objects, between life and the means of life, i.e. food (“Leben und Lebensmittel”), at the same moment deity and prostitute” (MEW 3)

Labour has a double character, it produces use values, which satisfy the needs of the others and it produces (exchange)value, which is based on the exchange of commodities on the market in a monetary or capitalist society. Here again needs come into the horizon of reasoning, because labour is socially useful and necessary only insofar as it satisfies needs. Social labour, therefore, is not only determined by its capacity of producing exchange values, it must also produce use values, i.e. products which satisfy social needs. The social character of labour, therefore, can only be conceptualised as an unity of exchange value and of use value production. Since human needs belong to the existence of human beings as social and natural individuals, the process of value production can only be understood as shaped by and at the same token shaping the societal relation to nature. Whereas Marx in his early writings, following the Hegelian tradition, takes needs in his considerations, in his later writings, beginning with the philosophical-economical manuscripts of the late 40s of the 19<sup>th</sup> century, he detects the notion of labour and the manner in which labour is organised in a capitalist society. The reason is quite clear: it has to be understood how labour not only produces values, but also surplus value and by doing

so reproducing capital – and exploitation of labour - as a societal relation at an always higher level. The capitalist production and reproduction process is a spiral (interrupted by periodical crises) of growth and the “ladder on nature” – as Marx calls it - always becomes longer and longer.

There are many questions involved in the process of value production. Value is always a societal relation between commodities and between their owners (“*Warenhüter*”). The societal relation of commodity-owners contains no piece of nature; nature is absolutely excluded from that societal relation. Even money, which Marx conceived at his times as golden money, represents only a social relation. The metallic character of gold is completely unimportant for gold in its money-form. Therefore, it is possible to substitute paper money and - in our times - electronic bits and bytes for metallic gold and silver money. It is important to comprehend the immaterial and unnatural character of the societal exchange relation, although the exchange of commodities has a material and energetic quality. This dual sidedness also is the origin of commodity fetishism, which Marx describes at the end of the first chapter of the first volume of the "Capital" (MEW 23: 85-98). The message is very clear: it is not easy to understand the societal relation of men to each other and of men to nature, because it prerequisites an intellectual endeavour for overcoming the inherent fetishism.

The analytical figure of the double character or dual sidedness of labour in Marx's analysis of the capitalist production process brings him forward to distinguish between production as a labour process and of a process of value production (valorisation). The labour process can be best understood as a transformation of natural material and energy into use values which serve the satisfaction of human needs. There are three *caveats* which must be introduced here.

The first is concerning a certain anthropo-centrism involved in an analysis of the metabolic character of the production process because it is linked to human needs; other effects of metabolism therefore very often are ignored. Therefore, from the viewpoint of energy analysis the production process may look very different compared to the viewpoint of commodity- and value-analysis. Juan Martinez-Alier mentions with regard to the different perspectives: “The productivity of agriculture has not increased, but decreased, from the point of view of energy analysis”

(Martinez-Alier 1987: 3); but in terms of commodity-production in agriculture and in terms of return on invested capital the productivity has increased.

The second *caveat* has to do with a certain labour-centrism in the concept and a systematic neglect of nature. Some ecologists therefore reproach Marx with a certain negligence of the “value of nature” in the process of value-production (e.g. Immler 1984; Bunker 1985, Deléage 1989). But this rebuke only is relevant insofar as the labour process is concerned. Of course, nature is as important as labour in processing matter and energy into needed use values. Here, the laws of thermodynamics are valid, and the inputs and outputs are in energy- and matter-units quantitatively not different, but qualitatively changed into use values on the one hand and into waste on the other. In the course of the process from input to output man and nature work together; they are both equally important. But as a process of exchange value production it is only labour which creates value and surplus value. The reason which mostly is misunderstood by the critics of the Marxian concept of nature, is the following one: nature is wonderfully productive – the evolution of species in the history of the planet and their tremendous diversity and variety show it. But nature is not *value-productive* because it produces no commodities to be sold on the market. There is no market in nature. The market is a social and economic construct. The most beautiful bird or a very old tree in a tropical rain forest or the iron ore in a mine are no commodities; they only are changed into commodities by a process of valorisation (*Inwertsetzung; mise-en-valeur*). It is labour which performs the metamorphosis of nature into commodity. But it is not labour as such, labour *sans phrase*, but *labour power spent under the social form of capitalism and under the social condition of being the subjugated to the capitalist process of value and surplus value-production* (Altvater 1992: 250ff; similarly Burkett 1996: 64).

The third caveat to make is the following one. In a capitalist market society human needs are relevant only insofar as they appear as monetary demand on the market. Thus, it is obvious that in a capitalist society needs transform into monetary purchasing power, otherwise they are not acknowledged. For, money constitutes, as Marx sarcastically points out, the real and true community. Money is the match-maker of social relations and therefore concomitantly of the societal relation to nature.

The market-mechanism has to bridge the gap between labour and needs and therefore an analysis of needs has to take capitalist dynamics into account. The social form is always in, even in apparently exclusively natural processes. The natural conditions of the labour process however are transformed by labour. Marx writes, that

"...(l)abour... as the creator of use-values, as useful labour, is a condition of human existence which is independent of all forms of society; it is an eternal natural necessity which mediates a metabolism between men and nature, and therefore human life itself... When man engages in production he can proceed as nature does herself, i.e. he can only change the form of the materials" (*Capital*, vol. I, p. 133).

In this connection Marx refers to the Italian political economist Pietro Verri, who wrote in 1771:

"All the phenomena of the universe, whether produces by the hand of man or indeed by the universal law of physics, are not to be conceived of as acts of creation but solely as a re-ordering of matter. Composition and separation are the only elements...in the reproduction of value... and wealth, whether earth, air and water are turned into corn in the fields, all the secretion of insects are turned into silk by the hand of man, or some small pieces of metal are arranged together to form a repeating watch." (Pietro Verri, *Meditazioni sull'economia politica*, quoted in *Capital*, vol. I, 133-134).

Thus, the capitalist dynamic can be characterised as bound to the laws of nature and to the limits which nature always sets *vis-à-vis* any human activity. This is the reason why Marx concludes, "that labour is not the only source of material wealth, of use-values produced by labour. As William Petty puts it, labour is the father and the earth its mother" (MEW 23: 58). But by applying the laws of nature in the labour process man transforms nature into a man-made nature, a "humanized" nature which at the beginning of each production process is tapped and at the end of consumption is used as a sink for the waste produced.

The other side of the production process however is creation of value and surplus value, i.e. capitalist accumulation and economic growth. Because of the self-referential character of capital this side of the production process does not know or accept external, i.e. natural limits to its dynamics. The idea of growth without limits is a direct consequence of the immanence of fetishism in the social forms which rule the societal relations of men. A good example of this growth fetishism is Richard A. Easterlin's book, entitled *Growth triumphant* (Easterlin 1998). The contradiction between limited nature together with limited needs (Marx refers very often to the

Aristotelian understanding of needs as reflecting the humane measure) and unbound accumulation of capital is inscribed into the money-relation. For, metallic, i.e. seemingly “natural” money very soon reaches natural limits compared with economic demand. The gold circulating in a given economy is quantitatively never sufficient for the growing demand of commerce and for the interventions of central banks in their function as “lenders of last resort”. Therefore it is quite logical to substitute mere symbols of money (paper) as a social relation between seller and buyer and between creditor and debtor for gold as a “money with a natural face”. Paper-money or immaterial money as bits and bytes can be created in the amounts necessary for the currency circulation on the world market. Gold is natural, but gold money is social. In the latter function it can be substituted by mere symbols. This is an aspect of disembedding of the economic sphere from social and natural boundaries (Polanyi 1998; Altvater/ Mahnkopf 1999).

The labour-process at the same time shows productive and destructive effects, or to interpret it in the categories of thermo-dynamics: because of the double sidedness of the production process in which not only exchange value and surplus value are produced, but by the same token in the labour process matter and energy are transformed, entropy necessarily increases. In the interpretation of Ilya Prigogine an increase of entropy is the unavoidable expression of a transformation of matter and energy in the process of natural - and we may add - social evolution (Prigogine/ Stenger 1986). Marx interpreted the development of productive forces as positive for mankind, because they constitute the basis of a communist society in which the ruling principle is: everybody according to his and her needs. The binding restriction in this society is not the self-referential valorisation of capital but the human measure in a humanised society. Since men and the needs are part of the natural reproduction cycle, the new social formation which distributes wealth according to human needs is also thought as a society of reconciliation of men and nature.

The process of entropy production, however, is destructive because it undermines the means of social and natural self reproduction. By producing use value which potentially satisfy human needs, inevitably also waste is produced. Each production process is a linked process with useful and useless or even detrimental output. It is physically impossible to transform matter and energy without producing waste and

therefore externalities. Marx is well aware of the power of destruction unfettered by capital accumulation. At the end of the long 13<sup>th</sup> chapter of the 1<sup>st</sup> volume of *Capital* on the "Great Industry" Marx also mentions the tendency of industrialisation of agriculture by concluding that in an agricultural system subjected to the regime of industrial rationality

"all progress increasing the fertility of the soil for a given time is a progress towards ruining the more long-lasting sources of that fertility. The more country proceeds from large-scale industry as a background of its development..., the more rapid is this process of destruction. Capitalist production, therefore, only develops the techniques and the degree of combination of the social process of production by simultaneously undermining the original sources of all wealth - the soil and the worker." (*Capital*, vol. I, p. 638)

The substitution of natural cycles and time-space regimes by industrial cycles and time-space regimes in agriculture has a detrimental impact on the environment, the natural as well as the built one and on the social system. This is a key factor for the aggravation of the ecological crisis of capitalism and for the counter-movements against it.

## **Crises**

There are many indirect effects of capitalist value production on nature, since capitalist accumulation is a crisis ridden process. Marx analyses the periodical crises of his times, in the first instance under the aspect of the effects on living and working conditions of the working class. In his times cyclical economic crises were a very new experience, first mentioned by Sismondi at the beginning of the 19<sup>th</sup> century. States of extreme emergency, such as hunger and starvation in consequence of a bad harvest or a natural catastrophe, were deeply sunk in the memory of peoples. It always was clear and self-understanding that the causes of these crises are beyond human influence, although even in pre-capitalist and pre-industrial times crises have been triggered by human activities: overuse of land and resources (the extinction of European woods in the medieval), the pest, or warfare. But since the emergence of industrial capitalism economic crises periodically broke out, increasing the insecurity of broad layers of the population due to the losses of jobs and income. Marx observed very carefully the development of crisis-cycles since the 50s of the 19<sup>th</sup> century with the expectation that economic and social instability in the course of the

crises provoke social unrest and political, revolutionary change. But Marx was also aware that the capitalist crisis works like a “fountain of youth” where the capitalist system finds its remedies for recreation, stabilisation and new dynamics in a new upswing of the economy: “creative destruction”, as Schumpeter later called it. Later Antonio Gramsci should analyse the crisis as a process of transition and of “transformism”, as a means to stabilise bourgeois hegemony.

In our times we have to take the global character of crises into account. More than ever before in history crises take the form of a financial crash before affecting the economic, social and political system. As financial crises they have a global reach because financial markets are liberalised and deregulated, spreading from one place to another. The first reason is the “herding effect”. Foreign investors withdraw their credits and sell their assets, in order to exchange them into secure currencies. Then, because of the “contagion effect”; the crisis of one currency affects also others. In its form as an economic crisis, it necessarily affects local places, the nation state, the population and therefore one is used to call the global financial crises of the last decade Asian, Mexican, Russian, Brazilian or Argentinian. The financial crisis therefore appears as a remote and virtual event, whereas the local economic crisis not only has a name, i.e. the country’s name where it hits first and strongest, but also very real effects on the “real” economy and society. Because of the seemingly virtual quality the crisis also seems to have no really detrimental and prejudicious effects on society and nature. Why then speak about the crisis of capitalism? In post-modern thinking this makes no sense. Only as a real crisis it has visible consequences, which are interpreted as the result of political mistakes made by irresponsible governments or crony capitalism and which have nothing to do with the working of global markets. The Marxian approach, contrary to these assumptions, always is aware that money and capital apparently are self-referential entities, but that in reality the autonomy of the global financial sphere vis-à-vis the real sphere is a fictitious one. The crash makes an end to this fiction and the reality-show of wealth-destruction begins. No wonder that therefore poverty increases in the course of the financial crises in Asia, in Russia or in Latin-American countries.

On the other hand, however, also wealth increases because the expropriation of debtors is the reverse side of a sometimes merciless appropriation of wealth by

creditors. Very often ecologists say that poverty is one of the main causes of ecological destruction, especially the World Bank follows this assumption. But this is not true. It is inequality and injustice which is detrimental not only to social cohesion but also to nature. The poor are set back to a satisfaction of so called basic needs, whereas the rich have accumulated so many claims against nature that they can greedily expand the "environmental space" which they dominate and exclude others from orderly using it, so that they develop destructive practices of overusing those resources which are at their disposal. The "ecological footprint" of the rich is much larger than that of the poor. The CO<sub>2</sub>-emissions of an average citizen of the USA in 1999 were 20,2 t, this is more than ten times the emissions of an average Brazilian who pollutes the atmosphere with 1,8 t CO<sub>2</sub>. Empirical studies performed in many parts of the world exhibit the detrimental collusion of poverty and wealth in the process of nature destruction. In the Amazon for instance the poor settlers overuse their patches of land because the wealthy land owners use land as an object of speculation. Again, we are faced with the consequences of a rupture between labour and needs due to the power of individualistic greed. It is destructive for social cohesion as well as for the relationship to nature, i.e. for sustainability of social and environmental relations.

The "humanised nature" of which Marx emphatically spoke in his early writings can also be less emphatically and therefore more soberly understood as a man-made nature. It consists of the ensemble of a produced environment i.e. of streets, bridges, harbours, airports, cities, parks and agriculture which cover together nearly 100% of the terrestrial surface. Even the oceans are more and more "humanised" i.e. a product of man. Pollutants change the quality of water, over-fishing does irreparable harm to maritime fauna and flora and a permanent noise is interrupting the silence of the sea. Firstly, therefore man-made nature comprises the totality of external effects. Most of them have to be considered as negative external diseconomies, only a few of them as external economies providing social benefits. External effects are an inevitable concomitance of transformations of matter and energy. They demonstrate, that nature is more than a mere collection of more or less useful resources, that it is an extremely complex totality of man-nature-relations, so as Marx envisaged it already in his early writings. The concept of external effects only partly reflects the systemic nature of the human-natural system. However, it exhibits the limits of free market theories and

of the assumption of rationally acting market actors. Even worse, their individual rationality transforms into social irrationality and into decisions which do not respects the conditions of natural reproduction.

Nature functions as a medium of the exchange of externalities which are called external, because they cannot be regulated by the market mechanism. This fundamental aporia of classical and neo-classical theory can only be overcome by way of excluding time and space i.e. the dimension of nature from their theoretical body (Altvater 1989). It is necessary to conceive the economy as an undertaking beyond historical time and space (for the distinction between historical and physical time and space viz. Georgescu-Roegen 1971), because otherwise the theory has to admit that economic transformations (consumption of energy and matter) have irreversible effects on nature whether externalities are internalised or not. Internalisation is only relevant for economic calculation and for decision makers, but not for the natural system. The Marxian approach has not these problems, because, first time and space are central categories in the critique of political economy (circulation time; transport in space). Secondly, because nature as a humanised nature, i.e. as a produced nature, it is part of the general conditions of production. The violations of their integrity by a degradation or even destruction of natural conditions of production and reproduction, therefore, is nothing external to the economy, but belongs to its contradictory development. The negative effects of air and water pollution, of the violation of the laws of food safety or of the overuse of oceans and of land-erosion have a direct (negative) effect on the reproduction costs and productive capacity of labour power and therefore on the process of surplus value production. The costs of clean air and clean water belong to the capital outlays and therefore increase the amount of constant capital fixed in the production process with the effect of an increasing organic composition of capital. Hence, the profit rate will fall (of course *ceteris paribus*). Only under the assumption that nature has an infinite capacity of absorbing negative effects, they can be ignored. However, the capitalist accumulation process tends to transgress the borderline of natural conditions of reproduction, and consequently the theory has to take nature into consideration. This seemingly was unnecessary as long as “limits of growth” or environmental problems were unknown and therefore no theme in scientific and political discourses.

The environment in always greater part appears as a “built environment”, as produced by man. It is conceived as the provision of public goods, which include not only the cultural and natural commons, but also the material and immaterial infrastructure produced. David Harvey explains with regard to production and consumption:

“We can... usefully distinguish between fixed capital enclosed within the production process (e.g., the instruments of production) and fixed capital that functions as a physical framework for production (e.g., factories). The latter I call the *built environment for production*. On the consumption side, we have a paralleled structure. A *consumption fund* is formed out of commodities that function as aids rather than as direct inputs to consumption. Some items are directly enclosed within the consumption process (consumer durables such as stoves, washing machines, etc.), while others act as a physical framework for consumption (houses, sidewalks, etc.) – the latter I call the *built environment for consumption*” (Harvey 1989: 64)

What Harvey calls “built environment” today is discussed under the broader and more comprehensive label of “public goods”. It is not suitable here to go into the details of discourses on public goods (Kaul et al 2003; Altvater 2003; Brunnengräber 2003). In Marx’ theory the “built environment” is discussed as the “general conditions of production” which as a rule have to be provided by the state – at least as long as the system of property rights is not developed enough as to offer secure assets to private investors (Grundrisse: 422-432). David Harvey stresses the importance of the “spatial and temporal fix” in the course of capital accumulation because “...this is not a minor sector of the economy and it is capable of absorbing massive amounts of capital and labour, particularly under conditions of rapid geographical expansion and intensification” (Harvey 2003: 63). Moreover, if the expenditures on built environment or social improvement prove to be not productive and profitable, “overaccumulation of values in built environments or education can become evident with attendant devaluations of these assets (housing, offices, industrial parks, airports, etc.) or difficulties in paying off state debts on physical and social infrastructures...” (Harvey 2003: 65). The built environment, therefore, is not only passive part of the crisis-cycle, but the core-sphere of accumulation and therefore an important cause for the dynamics as well as the crises of capitalist accumulation. Because of this importance Harvey criticizes “those accounts of the dynamics of capitalist accumulation who either ignore these matters entirely or treat them as epiphenomenal” (Harvey 2003: 65).

Hence the category of the built environment is apt to link the dynamics of capitalist accumulation and the role of the environment. This is the reason why James O'Connor (1988) in a seminal article in the journal "Capitalism, Nature, Socialism" develops the proposal to found an "ecological Marxism" on a double understanding of the capitalist crisis. Firstly, the crisis is interpreted in traditional categories of Marxist crisis theory. In general terms and a little simplified, the dialectics of productive forces and relations of production trigger a cyclical business cycle including a more or less deep crisis. Marx himself outlined a step-by-step argument. First he showed the possibility of a crisis implicit in commodity production and circulation. Then he proved the necessity of crisis in the course of the contradictory processes of production and accumulation, especially due to the periodical and tendential fall of the profit rate. Thirdly he described and analysed the concrete reality of crises with all the concrete aspects which differ from case to case in time and from country to country in space. James O'Connor is not interested in this briefly outlined approach. He points to another set of contradictions arising from the effects of capitalist development on the conditions of production, i.e. in other terms on the built environment. He not explicitly refers to a traditional discourse ranging back to Adam Smith and David Hume, who were well aware that a capitalist system can only survive insofar as the sovereign provides public goods. Otherwise commercial security is not warranted and insecurity makes commerce expensive or even impossible. Also Marx wrote about the general conditions of production in a different way than Adam Smith. He followed the assumption that general conditions of production only so long will be provided under the responsibility of the sovereign (of the government) as private capitalism is not developed enough as to make public goods exclusive, as to establish private property rights and transform them into private goods, which can be financed by investment in assets. Then financing of public goods out of the revenue of the state is unnecessary, general conditions of production, therefore, in Marx's opinion can be public goods as well as private goods. All depends on the stage of development of a given capitalist system (Grundrisse: 422passim).

The discourse on general conditions of production (i.e. on public goods) by its very essence is a politicised one because the state, the political system and the power structure of a given society from the very beginning are involved. James O'Connor is

very clear with regard to the politicisation of discourses on general conditions of production:

"Precisely because they are not produced and reproduced capitalistically, yet are bought and sold and utilised as if they were commodities, the conditions of supply (quantity and quality, place and time) must be regulated by the state or capitals acting as if they are the state. Although the capitalization of nature implies the increased penetration of capital into the conditions of production (e.g. trees produced on plantations, genetically altered species, private postal services, voucher education, etc.), the state places itself between capital and nature, or mediates capital and nature, with the immediate result that the conditions of capitalist production are politicized" (O'Connor, 1988, 23).

The actors who politicise the economic issue of the provision of public goods or of the general conditions of production respectively embrace, first, the state represented by the government, the parties, the administration etc., secondly, capitalists, representatives of corporations or employers associations, thirdly trade unionists and fourthly, NGOs and CSOs and new social movements. Social conflicts and discursive struggles are not only centred around the class structure, class conflict and class interests in a capitalist society, but also around the societal relation of man to nature, the built environment, the general conditions of production, on the question of the quality and quantity of the provision of public goods:

"Most problems of the natural and social environments are bigger problems from the standpoint of the poor, including the working poor, than for the salariat and the well-to-do. In other words, issues pertaining to production conditions are class issues, even though they are also *more* than class issues..." (O'Connor 1988: 37)

The second contradiction, therefore, triggers new social movements and their activities (also Leff 1998); The crisis of the "conditions of production" or over the provision of public goods is politicised (also Kaul et al 2003). A further aspect is important in O'Connor's position. He concludes that capitalist accumulation is "impairing or destroying capital's own conditions hence threatening its own profits and capacity to produce and accumulate more capital" (O'Connor 1988: 25). He gives some examples which we already mentioned before as negative external effects:

"...the warming of the atmosphere will inevitably destroy people, places and profits, not to speak of other species life. Acid rain destroys forests and lakes, and buildings and profits alike. Salinization of water tables, toxic wastes, soil erosion, etc. impair nature and profitability. The pesticide treadmill destroys profits as well as nature. Urban capital running on 'an urban renewal treadmill' impairs its own

conditions hence profits, e.g., congestion costs, high rents, etc. The decrepit state of the physical infrastructure in this country may be mentioned in this connection. There is also an "education treadmill", "welfare treadmill", "technological fix treadmill", "health care treadmill", etc." (25, *passim*).

O'Connor describes the degradations of general conditions of production as an "underproduction crisis". He adds: "we can safely introduce 'scarcity' into the theory of economic crisis in a Marxist, not neo-Malthusian, way. We can also introduce the possibility of capital *underproduction* once we add up the rising costs of reproducing the conditions" (O'Connor 1988: 26; for a critique *viz* Altvater 1993: 218 *passim*). So we can state an overproduction or overaccumulation crisis in "traditional Marxism" and an underproduction crisis in "ecological Marxism", respectively.

This distinction, however, is not fully convincing. The category of underproduction is based on the assumption of a reproducibility of the natural conditions of production and it means nothing else than ecological degradation and the (social) costs which follow the restoration of the built environment:

"Examples include the health bill necessitated by capitalist work and family relations; the drug and drug rehabilitation bill; the vast sums expended as a result of the deterioration of the social environment (e.g. police and divorce bill); the enormous revenues expended to prevent further environmental destruction and clean-up or repair the legacy of ecological destruction from the past; monies required to invent and develop and produce synthetics and 'natural' substitutes as means and objects of production and consumption; the huge sums required to pay off oil sheiks and energy companies,...; the garbage disposal bill; the extra costs of congested urban space; the costs falling on governments and peasants and workers in the Third World as a result of the twin crises of ecology and development. And so on..." (O'Connor 1988: 26).

Many of these examples are mentioned and empirically analysed by K. William Kapp in his famous book on "the social costs of private enterprise" (Kapp 1958). Thus the facts are not new, the discourse, however, on the facts is. It however is rather doubtful, whether the category of an underproduction of the general conditions of production makes sense, and whether it is analytically more powerful than the categories developed by Marx for an analysis of the capitalist accumulation and expansion process. In the first volume of the *Capital* Marx describes the production process as a process of reproduction of social relations between labour and capital. Since we know that these relations also include the societal relation to nature, the analysis of the reproduction process can be extended in order to grasp the dynamics of man-made nature, of the humanised nature, the general conditions of production

and the built environment. Different from the reproduction of labour (including also the gender-relations in households) the reproduction of nature follows quasi-eternal natural laws which can only be used by men and must therefore be respected. With regard to the natural laws the assumption of an underproduction is not very convincing, since it prerequisites the possibility of reproducibility and circularity of processes, whereas in nature all processes are characterised by irreversibility. This is in contrast to the autopoietic, hence self-referential character of capital which cannot and does not respect the limits of nature. The capitalist mode of production consequently is detrimental to nature and therefore to men. The repercussions on capital itself, which are one of the main arguments of James O'Connor, are without any doubt a crucial point (Martinez-Alier 1987: XIX).

### **Valorisation**

The process of capitalist accumulation takes place in the coordinates of time and space. In time its logic is acceleration. The increase of productivity for the production of relative surplus value is nothing else than the acceleration of all processes in production as well as in circulation, so that more products can be produced in the same unit of time. By accelerating all processes it is also possible to extend the reach of capitalist production and reproduction in space. Therefore the spatial expansion of capital belongs to the dynamics of capitalist accumulation. Expansion is only possible in so far as limits and boundaries are removed, may they have their origin in natural conditions or may they have been set by political institutions. Therefore Marx writes in the "Grundrisse" on the world market as from its very beginning included into the category of "capital" (Grundrisse: 311). Today we may interpret this tendency mentioned by Marx as modern globalisation. Globalisation has become reality because it is the actual emanation of immanent potentialities of capitalist accumulation. Globalisation is a process of endless valorisation of all those parts of nature, which formerly have been outside the valorisation-logic of the capitalist system. The expansionary tendency in space and time is an important theme in the "Grundrisse" (415-435). It has been described by the traditional theories of imperialism from Luxemburg to Lenin, Bucharin and Kautsky. But valorisation cannot only be understood as a process of territorial

conquest. The spaces to be discovered, intruded, conquered and integrated into the capitalist system of value production include also the ice caps of the poles, the soil of the deep sea, the most remote jungle areas of rain forests, the outer space and - more and more important - the nano-spaces of the genes of plants, animals and human beings. Capitalism is an expansionary system, and everything is interpreted as a raw material for the process of value and surplus value production. If it is not useful and because it can not fulfill this necessity the raw material will be considered as useless, without a value and therefore not an appropriate object of capitalist valorisation. By separating the valuable from the useless resources the integrity of nature inevitably is going to be disintegrated – and disintegration of nature is its destruction.

Valorisation in principle is an infinite process, it never ends, unless capitalism comes to a not surmountable barrier. The most destructive aspect of valorisation is the selection between valuable and not valuable resources. It can be studied for instance in the rain forest of the Amazon that the valorisation of timber is destructive for the forest as an ecosystem. At the end there is no timber any more, because the reproduction of the forest is impaired. This is obviously a case of underproduction in the sense of James O'Connor. The consequence is, that the once destroyed forest due to an overexploitation of timber cannot be reproduced within a time horizon comparable to that of people who exploit and destroy the ecosystem. At least in the rain forests, the recreation of a degraded ecosystem is lasting much longer than its destruction. The exploitation very often is a question of days, the recreation a question of decades or centuries. The unevenness of times regime in a given society is one of the main reasons of ecological destruction, of “underproduction” in O’Connors sense.

### **Entropy**

Irreversibility indeed is a decisive category to understand the development of nature. Since capital is following a logic of reversibility and circularity, the natural and the capitalist time regime are not compatible. Capital has to appropriate the surplus and invest this surplus again into the production process, which at the end will again result in the appropriation of a growing surplus. The compulsion to aim for a surplus is inescapable, if production processes have been financed with credits and interest

has to be paid. The performance indicators of capital indicate very clearly the circularity and reversibility of the flow of capital within the relationship between results and outlay. Profitability, marginal efficiency of capital, return on capital, rentability and other indicators clearly demonstrate that the rationality is based on a comparison between the means i.e. investment and aims i.e. profit or surplus.

In contrast, natural processes of transformation of material and energy as well as the natural growth process of living beings like plants and animals are characterised by irreversibility. This follows ultimately from the law of entropy. At the end of the process there is something qualitatively new (in the rationality of reversibility the quality remains the same, whereas the quantity of the same quality changes). This qualitatively new product can not be reproduced with the same energy or matter, thus the stocks of energy and matter are used until their depletion, unless the system is an open one and new energy and new matter are supplied for transforming them into use values. But here again the problem is involved that each production process is linked production. In the understanding of Herman Daly there is not only the straightforward process from inputs to outputs, but also the production of throughput (Daly 1991). It is a natural law that it is impossible to transform 100% of energy-input and of matter into products designed for the satisfaction of human needs. Therefore, we "enjoy our lives" (Nicholas Georgescu-Roegen 1971) by increasing the entropy of the whole system. Marx was full aware of this double-sided tendency. On the one hand the anthropo-centric transformation of matter and energy, of the living and not living nature into those things (i.e. into commodities) which are apt to satisfy our individual and social needs. On the other hand, there is the bitter consequence of a deterioration and degradation of nature exactly because need-satisfaction is guaranteed or the necessities of capitalist valorisation are fulfilled.

Nicholas Georgescu-Roegen introduced the notion of a "Promethean revolution" into his reasoning in order to show that the increase of entropy decisively depends on the energy regime. The industrial revolution as well as the neolithic revolution changed the energy regime; the one by developing devices to capture solar energy and to transform it into useful energy for man (mainly into foodstuff). The other substituted fossil energies which have been transformed into useful energy by means of the whole set of industrial infrastructures for the devices of solar energy transformation,

above all the agricultural system. No wonder, that Eric Hobsbawm in his “Age of Extremes” detects only one revolution in the course of the 20<sup>th</sup> century: that first time in human history beginning with the 50s the number of persons living on the countryside and working as farmers is lower than the number of persons dependent on urban industry. The transition from an agricultural to an industrial societal relation to nature is a radical change, a revolution – which only has a short living perspective.

The neolithic revolution has used the eternal flow of solar energy, and therefore the agricultural mode of production does not know energetic limits (although there are limits with regard to fertility of soil, agricultural techniques etc.). The fossil and industrial revolution, however, is based on the consumption of the limited fossil stocks of energy. Firstly, they will run out in a few decades and secondly their combustion is producing such an amount of climate killing emissions that the living conditions on earth will change – with consequences that nobody can predict except that they are prejudicious to life on earth. In the terms of thermodynamic economics the transition to capitalist industrial systems based on fossil fuels means that the planet Earth first is “globalised” and secondly treated like a closed system because the solar energy over millions of years stocked into the oil-fields and coal-mines is substituted for the solar radiation of the present. The Earth is a limited planet and therefore a sustainable energy-system only can be based on the openness of the energy system to the solar radiation (Georgescu-Roegen 1971; Daly 1991; Altvater 1995). The combustion inevitably increases the global entropy, and by trying to avoid this unpleasant outcome always new (and hundred years ago still virgin parts of the planet) have been included into capitalist structures of valorisation. This is the ecological reason why the Earth today is globalised and why we have to deal with global and not mainly local or regional environmental problems.

## **Conclusion**

The Marxian concept of the man-nature-relationship is much more appropriate to grasp the contradictions and dynamics of the societal relation of men to nature, i.e. of the relation between the economy, the society and the environment than other concepts do. The main reason consists in the understanding of the labouring man as transforming nature and therefore being included into a men-nature metabolism

which on the one hand is following quasi-eternal laws of nature and on the other hand is ruled by the dynamics of the capitalist social formation. “Formation” stands for the ensemble of social forms, beginning with the commodity form, the money form, the political form until the form of modern credit. Capitalist accumulation also is following the logic of “disembedding” which Karl Polanyi so convincingly described in his “Great Transformation” (Polanyi 1978; also: Altvater/ Mahnkopf 2002). This has been demonstrated in this article referring to metallic and symbolic money, i.e. “concrete” money based on a natural material and “abstract” money only representing the social form. The process of disembedding, however, also displays the extremely important aspect of the transformation of the energy system from biotic energies to the regime of fossil energies. Capitalist societies suppose to become independent on the solar flows of energy because they can use the stocks of fossil energies. For the capitalist societal relation to nature this transition opens many advantages. The contemporary energy-system is independent on the location because fossil energies are transportable. They are not bound into the limits of time because fossil energies can simply be stored in tanks etc.. And fossil energy can be concentrated where it is needed in huge factories and industrial clusters. Thus fossil energies are “homologue” to a dynamic capitalist system. This is the reason why it is so difficult to reduce the consumption of fossil energies in modern capitalist societies and why “eco-regulation” (Burkett 1996: 67passim) or a “sustainable” economy are so difficult to achieve. Under the pressure of being locally competitive in the global space a reduction of fossil energy-consumption will not happen voluntarily; only as the outcome of a collective action. As the quarrels about the Kyoto-protocol clearly show, collective action with a powerful superpower, free riders and weak states is difficult to realise.

Since the fossil resources very likely will be exhausted in a couple of decades the wars waged on the distribution of short resources already have begun. The war of the USA against Irak can be interpreted as an *ouverture* to the coming conflicts on oil-resources in the world. At this point of reasoning it becomes quite clear that the ecological question at the limits of the carrying capacity of the global ecological system includes also the other question: How to distribute justly scarce resources in a peaceful manner and how to organise the transition to a sustainable energy regime? The Marxian theory is helpful to understand the dynamics of the societal relation to

nature in modern capitalism. But the question also marks the transition from theoretical considerations to political practice...

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