Socialism, Capitalism and the Environment

by Alex Dirmeier

There is an upcoming ecological catastrophe on this planet, which puts in jeopardy the whole existence of life as we know it. This is an insight which is nowadays generally accepted. Global warming, pollution or the impending shortage and decline of fossil fuels are only some aspects of this cataclysm. It is also commonly accepted that the ecological problems are inherent to the economic activity of humans. Particularly, the capitalist world economy is causing many of the ecological problems. Not so common is probably the insight that these problems do not have resilient solutions using the economic methods of capitalism. This will be argued in the forthcoming sections.

The primary driving force of capitalism is the production for profit, the re-investment of profit and the expansion of the capital stock. Capitalism is dynamic and can be also innovative as long as there exist possibilities of profitable investment in sectors that advance the development of new technologies. At the latest when there are barriers for investment by the existence of monopolies, capitalism becomes technology-conservative. Monopolies impede the conversion of production technologies. This particularly includes the change to environmentally sustainable technologies. Additionally, all the sectors relevant for questions of ecology are highly monopolized in today's world economy and, in most cases, these monopolies are privately owned companies, or are state owned enterprises that act according to the profit motive. These ecologically relevant sectors of the economy include basically the petrochemical industry, the transport sector (including the producers of cars, trains, airplanes, and so on), energy production and distribution, but also many parts of agriculture.

We can observe that production is changing, new technologies and enterprises are emerging in the ecologically relevant sectors if and only if there are incentives given or constraints imposed to the economy from outside the economic system. In most cases this can only be done by the state. Hence, for example, the increase in production of renewable energy which we witnessed over the last 20 years, was only possible because profits of new Green solar and wind energy companies were largely subsidized by the state and, at the same time, the big energy monopolies were tranquilized by various contracts that secured the residual operating time of nuclear power plants and similar arrangements. This is exactly what happened on the basis of the amendment of the atomic energy act by the German Social Democrat/Green government in 2002[1]. The problem with this kind of ecological change is twofold. Firstly, the ecological conversion does take place slowly, and on a world scale it is not conceivable that proceeding in this manner leads to the possibility of avoiding the ecological catastrophe at hand. When we observe the political and economic events on a world scale which deal with ecological problems (see e.g., the Kyoto-protocol[2]), it is most likely that, in the long run, the interests of the capitalist monopolies will always dominate. It is argued below that the interests of the capitalist monopolies have to be broken in order to make substantial achievements. Secondly, the state funding of profits has to be paid for by somebody. As the state subsidizing of Green profits goes along with profit guarantees for the monopolies, and not the skimming of monopoly profits, the only possibility to pay for this kind of ecological change is by the redistribution of money from the working people into the capitalist pockets. Almost all ecological change that took place up to now, is paid for by

1 See http://de.wikipedia.org/wiki/Atomgesetz_%28Deutschland%29 (in German) for the history of the German atomic energy act and http://en.wikipedia.org/wiki/Nuclear_power_phase-out for some background on the status of nuclear energy also in different countries.

2 http://en.wikipedia.org/wiki/Kyoto_Protocol

all of us through taxes, higher energy prices and similar malpractices.

The ecological conversion necessary

If we look at the way our current world economic systems works in relation to the environment, what are hence the immediate necessary measures and changes to be made, so that the upcoming ecological cataclysm can be avoided? Maybe surprisingly, this question is not so difficult to answer when we look at the world with a bit of common sense.

The most important sector one has to analyze for an answer is energy production. This includes mainly the production of electricity, which is the backbone of our whole society, economically and culturally. But also the question of the production of thermal heat in the developed countries and the first-time supply of electricity to people in the underdeveloped countries by not using the same polluting energy production techniques. This is a very important question as, e.g., still 60% of the people in Africa do not have access to electricity[3]. In 2005, 81% of the world energy consumption[4] was attributed to the burning of fossil fuels[5]. There are estimates that this proportion will rise to 90% in 2030[6] if there is no fundamental switch in the energy production techniques. About 17% of the total world energy consumption is allotted to electricity[7]. The burning of fossil fuels generates 21.3 gigatonnes of carbon dioxide per year, only half of which can be reabsorbed by the environment[8]. Hence, a conversion of energy production towards techniques that do not burn fossil fuel is obviously necessary for pollution reasons, as well as for the fact that we approach the end of fossil fuel reserves on this planet[9].

One could be inclined to think that the expansion of energy production by nuclear fission provides a way out of this mess. This is disputable for various reasons. Firstly, the uranium needed to supply nuclear power plants is an element whose natural occurrence is essentially limited as well[10]. Secondly, one has to take into account the carbon dioxide balance of the whole process from uranium extraction and enrichment to the final disposal of nuclear waste. Expectedly, the figures for this balance are highly controversial[11]. But it is safe to estimate that, in total, the production of a kilowatt hour of electricity by nuclear fission produces at least one third of the carbon dioxide emissions that the production of a kilowatt hour of electricity by the burning of coal does. It is clear that under the pretense of a necessary massive extension of nuclear power to replace energy production by fossil fuels, neither the pollution problem nor the global warming problem could be solved. Thirdly, the nuclear disaster in Japan in spring 2011 has once again shown that there are still many unaccounted security risks in the operation of nuclear power plants. Moreover, the profit motive in energy production is diametrically opposed to an extension of security measures. Fourthly, the biggest problem with nuclear fission is the final disposal of the highly radioactive and toxic nuclear waste. The ecological problems connected with this are undisputed. Furthermore, the total costs for this final disposal are normally not paid for, by the energy companies operating the nuclear power plants, but are passed on to the state, and hence, are to

3 For this and other figures see the very well worth seeing film *The Fourth Revolution: Energy*, http://en.wikipedia.org/wiki/The_Fourth_Revolution:_Energy
4 http://en.wikipedia.org/wiki/World_energy_consumption
5 http://en.wikipedia.org/wiki/Fossil_fuel
6 http://de.wikipedia.org/wiki/Fossile_Energietr%C3%A4ger
7 http://de.wikipedia.org/wiki/Weltenergiebedarf
8 http://en.wikipedia.org/wiki/Fossil_fuel
9 See http://en.wikipedia.org/wiki/Peak_oil for some scientific estimates of the time frame of this exhaustion.
10 Although the factual supply situation with uranium is controversial and depends crucially on an estimate of up to now undiscovered deposits, one can surely act on the assumption that the uranium supply would not last much longer than 100 years if the percentage of nuclear power production is increased to cover for the burning of most of the fossil fuel.
11 See e.g. http://www.stormsmith.nl/ for a survey.

be paid by the whole society. Otherwise energy production by nuclear fission was just not profitable. Opposed to nuclear fission, nuclear fusion[12] is a totally different kettle of fish. Nuclear fusion, which aims to emulate the process of energy production taking place inside the sun, has been researched for over 60 years. It uses factually inexhaustible hydrogen as an energy source and is generally considered quite save. If it is really possible[13] to develop nuclear fusion to become a reliable technology of energy production in the next few decades, it can play a fundamental role in the future mix of renewable energy sources.

Therefore, there exists the necessity to start entering a circular flow economy in the sector of energy production. This means the goal must be to gain independence from limited energy sources and to not use a technology of energy production that produces more pollution and carbon dioxide emissions than can be absorbed by the environment. When we burn fossil fuel we already use, in the last analysis, solar energy. Solar energy that was stored millions of years ago in the genesis of coal, oil and natural gas. So, obviously, we have to switch to a direct use of solar energy that arrives on earth now. Together with energy production by wind, waves, tides and geothermal sources this energy production techniques are summed up as renewable, because they are factually available in an unlimited amount. Concerning thermal heat, it is necessary to consider thermal insulation of housing (as shelter against cold in northern latitudes and as protection from heat in the warmer latitudes) as a main field of necessary action. This needs large scale infrastructure and construction programs. Bearing in mind the urgency of the matter, due to the upcoming environmental disasters, it is necessary to consider a time frame of about 20 to maximally 50 years, in which the better part of this conversion of energy production should have taken place. Of course, already a time frame of 20 years is far out of the scope of profit oriented capitalist companies.

Another important sector of the economy which is intimately linked with environmental problems is the mobility sector. This includes a whole spread of sections of the economy. Maybe the most important among these sections is the automotive industry, because it constitutes the backbone of many national economies in the developed countries. But also manufacturers of other means of transportation, like trains, airplanes or bicycles are to be included in the mobility sector. Furthermore, the whole public and private transportation sector including railways, road networks, urban transportation, air travel and many more have to be counted into this domain. It is estimated that the whole transportation sector accounts for 20% to 25% percent of the world energy consumption and carbon dioxide emissions[14]. A simple comparison of the carbon dioxide emission per capita in urban transport between US cities and Western European cities shows that fully developed public urban transport systems can reduce pollution substantially[15]. It is quite obvious that a fully developed, highly maintained and affordable urban transport system is a key to reducing individual mobility and hence carbon dioxide emissions and pollution not only in the big cities, but also in mid-size towns. This is basically due to the facts that a public transport system runs on electricity, which can theoretically be obtained from renewable sources and that the energy expenditure per capita is much lower than in individual transport, e.g., by car. The only problem is that such public transport systems cannot be operated along capitalist lines. This means for example if they are fully developed and highly maintained, they can only be profitable for somebody at the same time if they are not generally affordable. The same hold mutatis mutandis for regional, national and international transportation. To

12 See http://en.wikipedia.org/wiki/Nuclear_fusion and http://en.wikipedia.org/wiki/Fusion_power for an overview and recent developments.

13 There are some reasons which make this seem viable, but also various reasons that stand against this perspective. (See some of the links on the Wikipedia pages in the previous footnote.)

14 http://www.worldenergy.org/publications/809.asp

15 http://en.wikipedia.org/wiki/Sustainable_transport

reduce carbon dioxide emissions and pollution caused by transportation there is a need for planned and integrated transport systems. This can only be achieved, in a way affordable for everyone, if the urban transport systems, railways, airlines and so on are publicly owned and are made to operate with the goal to provide the best possible transport system. Of course, this is not possible without massive investments into the transport systems and in many cases extra subsidies for maintaining operation will be necessary. These subsidies have to be provided by the state and have to be financed by taxes. If either the majority of the population or the capitalist companies then pay for this public transport system, is hence obviously a question of the balance of taxation and therefore a question of who has the power.

There is no perspective of completely abolishing individual transportation in the nearer future. It can be reduced by a proper public transport system, but, especially in the rural areas, many people are dependent on their vehicle. Although, recent technological developments make it nowadays feasible for the first time to consider the complete abolition of the internal combustion engine in the automotive sector and its replacement by an electric drive[16]. The big advantage of electric vehicles is their potential to operate on energy obtained from renewable sources, provided there is a conversion of energy production taking place. This reduces carbon dioxide emissions form individual cars immensely. Nevertheless, at the same time there is the need to further constrict individual transport and boost initiatives like car-sharing, which of course goes at the expense of the revenues of the automotive companies. Also recent developments of vehicle-to-grid[17] solutions provide a fascinating possibility for the construction of electric smart grids.

The petrochemical industry[18] manufactures various products from petroleum besides gasoline. The most important ones among these products are certainly the various kinds of plastics[19]. It is often forgotten that not only packaging, beverage bottles or lawn chairs are made of plastic, but all of our high-end technology products, that our modern culture is based on, like computers, cell phones or airplanes depend crucially on diverse, and often highly specific, kinds of plastics, which in the manufacturing process are combined with other important materials of metallic origin. Almost all these plastics are made of petroleum. Hence, this part of our economy is also directly affected by the upcoming shortage of oil. As plastics are nothing else than rearranged chains of polymer, similar to proteins that also occur in biological sources, it is theoretically possible to produce all necessary plastics from renewable primary products. This already works quite good for generic plastics, e.g., for packaging[20], where compostable bioplastics are already common. For the highly specific plastics used in high-end technological products or for other petrochemicals like industrial lubricants or paints, which are also economically crucial in their own way, no bioplastic source exists up to now. There are some scientific beginnings for this, but the truth is for those petrochemical products, there is no clue how to make them without relying on oil. Hence, there is the urgent need for research and development programs that investigate bioplastics further. Some research is already done in this direction, but not enough. The problem is, that on capitalist terms, finding a new alternative production method for a commodity is normally not as profitable as developing new commodities that can be produced by the same old methods. This follows from a simple consideration: sell more commodities, without investing in a fundamental change in machinery and you will make much more profit. An alternative source, and its development, for many petrochemical products will become definitely profitable as soon as the oil

16 There are considerations, that this would have been possible decades ago if the proper research would have been supported and not impeded by the automotive companies. Although this is very well conceivable it remains speculative.
17 http://en.wikipedia.org/wiki/Vehicle-to-grid see also http://en.wikipedia.org/wiki/Electric_car
18 http://en.wikipedia.org/wiki/Petrochemical
19 http://en.wikipedia.org/wiki/Plastic
20 http://en.wikipedia.org/wiki/Bioplastic

price rises much further. This will definitely happen in the future, but the threat is that it is too late to conduct all the necessary research in a speedy manner, then. Another important aspect to consider in this context is recycling[21] and the durability of commodities. Obviously, in capitalist production, with many commodities the problem is, that producing them in a way such that they can be more easily recycled or such that they have a higher durability, directly affects the profits to the negative side. This is the reason why many simple changes in production are not made. Just one example to underline this assertion. There is no technological reason why a modern smartphone could not be designed in a more modular way, such that components of it can be regularly upgraded. This could easily lead to an extension of the life time of high-end technological products. But it is an economic decision to design smartphones as integrated devices that can only be thrown away after two years of usage. In addition to that, there is also no technological reason why a smartphone cannot be produced, at least, in a way such that its components can be separated and recycled more easily after its life span. Not to do this is an economic, profit-based decision, too.

Of course there are many more sectors of the economy and the society, which ought to be considered in connection with the environment. Many of the problems in these sectors also need a conversion of production techniques or the development of new technologies. Many problems exist for example in agriculture, especially, e.g., the land consumption in food production, also in relation to the production of biofuel[22] or the production of green house gases by animal husbandry[23]. Other important issues that could not be considered in this article are the protection of the tropical rainforest[24] and ecological problems caused by mining operations. Some environmental problems appearing from time to time are generally considered to be caused by human economic activity, but their specific origin has yet to be properly researched. A famous example is the colony collapse disorder of bees[25]. Thus, there are many topics where resources of research are needed, but which most likely will not have an outcome that is marketable in a capitalist sense.

The ecological conversion possible

Is it technologically feasible to switch the technology of energy production in the whole world economy to renewable energy sources, while, at the same time, supplying the underdeveloped parts of the world with electricity for the first time and applying a massive infrastructural program for thermal insulation, within the next few decades? Do we need some kind of bridging technology to achieve this?

To begin with, one has to observe that all scientific surveys and papers, which deal with the technological feasibility of the conversion to renewable energy, basically agree that all the technological prerequisites are either existent today, or there is a clear idea of which further scientific developments are necessary and how they are to be done[26]. This is important because it shows that all the world's energy production can be converted to renewable energy sources without the need of a completely unknown or new technology or science. The potential for the conversion is present in today's technology and is nothing as distant as, say, space travel to the outer solar system. However, the main controversial roots in the question of the time frame necessary to implement this energy conversion. When one looks around in different papers the estimates of the time frame differ from two

21 http://en.wikipedia.org/wiki/Recycling
22 http://en.wikipedia.org/wiki/Biofuel
23 See e.g. http://www.sciencedaily.com/releases/2009/05/090507145752.htm
24 http://en.wikipedia.org/wiki/Tropical_rainforest
25 http://en.wikipedia.org/wiki/Colony_collapse_disorder
26 See http://www.dpg-physik.de/presse/pressemit/2010/pdf/DPG-PM%202010-21%20Energiestudie.pdf or http://www.ren21.net/Portals/97/documents/GSR/GSR2011_Master18.pdf or http://www.azimuthproject.org/azimuth/show/HomePage to name just a few sources for further reading in this direction.

decades to two centuries[27]. It is simply very unlikely that most of these surveys are scientifically flawed and, in fact, one can easily check the logical consistence of the conclusions in most of these papers. The reason for the different estimates of the time frames can, hence, only be caused by different, more or less implicit, assumptions on available resources for technology development, the possible pace of the redirection of investments and available monetary resources. Thus, one must conclude that there are no technological obstructions to implement the conversion of energy production within the next two decades, because these different assumptions *can all be changed by political decisions*. There is no law of physics that limits the deployment of resources into the development of necessary electricity storage facilities or smart electric grids. There is no law of nature that prevents the radical skimming of profits of the energy monopolies and their investment in Green technology. And at last, there is only a limit of monetary resources of the masses of working people if one would like to let them pay by redistribution of wealth for the ecologic conversion. The total wealth produced in society is so large that this ecological restructuring can be easily afforded. The only problem is that this wealth drains away into the profits of the technology-conservative big capitalist companies and into the speculation in the finance sector. Hence, there are only political obstruction to the implementation of the ecological conversion of energy production, but political conditions are made by humans and can, thus, be changed by humans. *We have to conclude that the time frame necessary for the conversion of energy production to renewable sources is essentially a political and not a technological problem.*

Hence, also the discussion about bridging technologies has no proper foundation. Maybe the most famous of these technologies, discussed nowadays, is the carbon capture and storage (CCS) technology[28]. The idea is to capture the carbon dioxide in the burning process of fossil fuel, mostly coal, and to transfer it to final disposal, i.e., to store it below ground. Firstly, one causes with this procedure an ecological problem similar to the final disposal of radioactive waste, because we have to make absolutely sure that this carbon dioxide will never come out again. It is controversial if this is even possible. Secondly, the whole idea of the necessity of any bridging technology is the attempt to solve a political problem by technological means. If there were an all-embracing political decision for the entry into a circular flow economy in energy production, no bridging technology is needed. The "big advantage"[29] of these bridging ideas is that they coincide with the profit interests of the big capitalist energy companies, themed by: keep at it! Just a few years more to squeeze some more profit out of old coal-burning power plants until the last cent of invested capital has amortized.

Thermal insulation of housing is a very important issue connected with energy production. A large part of the world's energy consumption is due to domestic heating or cooling, depending on the latitude. Also more northern countries have a higher demand for heating energy and in many cases heating is the biggest fraction of domestic energy usage[30]. The main factor responsible for this is old and badly insulated housing. Today housing and also office buildings can be constructed in a way, so that do not need any classical heating[31]. It is even possible today to insulate old buildings in a way, so that they nearly do not need any classical heating any more[32]. Of course, this becomes more and more costly with more northern latitude. But it is estimated that with today's technology all housing as well as public and office buildings, at least south of the polar circle, could be insulated in such a way that for

27 See Hermann Scheer, *Der energethische Imperativ*, 2010 for a politically motivated optimistic scenario. This book will soon be available in English with the publisher Earthscan. There are several further recommendable books by the same author: *The Solar Economy,* 2004; *The Solar Manifesto,* 2005; *Energy Autonomy,* 2006 (all Earthscan).

28 See http://en.wikipedia.org/wiki/Carbon_capture_and_storage

29 Beware! Irony and sarcasm!

30 See e.g. http://en.wikipedia.org/wiki/Domestic_energy_consumption

31 http://en.wikipedia.org/wiki/Passive_house

32 See e.g. the film *The Fourth Revolution: Energy*, http://en.wikipedia.org/wiki/The_Fourth_Revolution:_Energy

them no specific energy usage for heating or cooling is necessary any more[33]. That means, for example, all additional heating could be provided by heat sources available anyway, for example by a teleheating network[34]. Hence, while this is technologically possible, the problem of implementation is a political and economic one. Because, what is needed for the implementation of such an insulation program? A large-scale program of investment in construction measures to insulate all or nearly all buildings and to build new ones, as well as a lot of infrastructural tasks to construct teleheating networks. But, although possible, this investment does not, or only at a very small scale, take place, because it is not profitable. People do not pay for not heating, they pay for heating to the electricity, gas or oil companies. A large-scale thermal insulation program is nothing that can be profitably sold to the masses of people who benefit from it. So this only takes place within capitalism if profits of the construction companies are paid by the state, and the state very often only does this if it can reallocate the costs to the people. Hence, it seems quite unlikely that such a thermal insulation program, which is both possible and necessary, will ever take place under capitalist conditions.

The provision of electricity to all urban and rural areas in the developed countries took decades to achieve. Part of the reason for this is that a large-scale infrastructure of electricity transmission lines and networks together with centralized big power plants had to be created. In the past the steady provision of the same electric voltage in a large network could only be guaranteed in this way. Today with the development of smart grids[35] this is changing. The step to more localized energy production, e.g., by solar and wind sources, which can by the smart grid technology nevertheless provide a steady electric voltage, away from centralized power production should be viewed as technological progress and as an important development of the means of production. Of course, there is still the need for central electric backbones in the network, which can for example be actualized by hydro-electric power. Still, the conversion of all power grids to smart grids require substantial investments into infrastructure and the replacement of coal-burning power plants is opposed to private profit interests embodied in them. *Hence, there is a need for a public program of environmental investments into big infrastructure projects and the conversion of energy production, which is opposed to the interests of the big energy monopolies*. Moreover, localized electricity production is the only way to electrify rural areas in the underdeveloped countries[36]. It is completely illusive to believe that the development of theses countries could proceed along lines which emulate the path of development that took place in the industrial nations. To try do implement the development this way would even be an ecological disaster.

All considerations in the previous paragraphs also hold mutatis mutandis for the sectors of mobility and the petrochemical industry. The necessary reduction of individual transport by the investment into public transportation systems goes in any case against the profit interests of the international automotive companies. Even with the simultaneous promotion of and conversion to electric cars, it is quite obvious that the total number of individual vehicles in the world is not sustainable. And the transport systems in the threshold countries cannot grow in a way emulating the individual transport culture in the industrialized nations. This leads straight into ecological disaster. Thus, it is clear that there must be a conversion of production of the automotive companies and also a redirection of capital and investment to other sectors of the economy. It is doubtful that this can be accomplished by market forces within capitalism. There must be a political decision for this and the companies have to be coerced to obey the political will. The same holds for the companies in petrochemical industry.

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33 See e.g. the books by Hermann Scheer in the Suggested Further Reading section.
34 http://en.wikipedia.org/wiki/Teleheating
35 http://en.wikipedia.org/wiki/Smart_grid
36 See e.g. the film *The Fourth Revolution: Energy*, http://en.wikipedia.org/wiki/The_Fourth_Revolution:_Energy

No Green capitalism

The idea of a Green New Deal[37] is discussed also among the political left and in the labor movement since the impact of the world financial and economic crisis. The basic question in this debate is the following. Can capitalism develop a new dynamic of growth from the investment into Green technology and the conversion to sustainable production? Maybe with an initial push by state subsidies?

Based on the considerations in the previous sections such a scenario seems unlikely and additionally would not be very desirable for the majority of the people. As we described above, capitalism is dynamic and grows if there is the possibility for profitable investment into the *expansion* of markets and production. Many sectors of the present capitalist world economy are highly monopolized and profit rates are low. This is one reason for the redirection of much capital into speculation. But the necessary measures to enter a sustainable circular flow economy, which were described here, most of the times do not constitute an expansion of markets and production, but a *conversion*. Often a redeployment of capital is necessary before it has fully amortized. For example, when it comes to switching off nuclear power plants in the nuclear power phase out or the massive extension of public transport at the expense of automotive profits. This can be a bit different in the threshold or underdeveloped countries, were also the factor of imperialism has to be considered. Simply because where no coal-burning power plants exist, energy production does not have to be converted, but can be build up in a sustainable way from scratch. Most of the measures necessary for a sustainable future are of public interest, but can not be transformed into commodities to be sold and extracted profit from. Therefore, ecological sustainability cannot be achieved as a classical abstract economic growth, but has to be achieved as the growth of specific sector of the economy and the research and development at the expense of others.

A kind of Green capitalism is conceivable as the continuation of today's situation of state subsidizing of Green (e.g., solar) companies, by redistribution of the costs to the majority of the people and rising energy prices. This would simply mean a further worsening of living standards for the majority of the people and a kind of eco-for-high-income-earners capitalism. This could maybe absorb some of the global ecological problems, but their final solution in this way is doubtful, as their ultimate capitalist cause would not have been eradicated, but an eco-version of capitalism would have been allowed to grow besides it. Moreover, the majority of the people would be made pay for that partial conversion, instead of the capitalist causers, who would still make a fortune.

On Eco-socialism

Within the broader Left and Green movement there is a current which calls itself eco-socialist or is attributed this label. Some strongholds of this current are in the Left-Green parties in Scandinavia and in the Green Party of the United States. Two main eco-socialist thinkers are Joel Kovel[38] and James O'Connor[39]. A good overview of the eco-socialist ideas can also be found on the associated Wikipedia page[40].

The ideas, goals and methods of the eco-socialists, in political praxis as well as in theory, root in Marxism and the Greens movement. Their aims are compatible and largely coincide with the program

37 http://en.wikipedia.org/wiki/Green_New_Deal
38 http://en.wikipedia.org/wiki/Joel_Kovel
39 e.g. *Natural Causes: Essays in Ecological Marxism*, 1998
40 http://en.wikipedia.org/wiki/Eco-socialism

outlined in this work. However, their original contribution to the movement is the construction of a specific theory of Eco-Marxism and the enrichment of classical socialist and Marxist ideas and programs with ecological considerations. This makes the eco-socialist current a valuable ally and an important integral part of the left and the labor movement. Certainly, the attempt to create a consistent eco-Marxist theory is an interesting task in its own right, but it is not necessary to draw up a program of ecological measures required today to avoid the imminent ecological catastrophe under capitalism. As it was tried to outline in the previous sections, classical Marxist economics is sufficient to analyze today's ecological disaster caused by capitalism, as well as the socialist way out of it. In order to draft the concrete measures necessary and possible to start into a circular flow economy, one does not even need Marxist theory. Basically, these tasks already follow from common sense.

Planning investment

It should be understood from the considerations in the sections above that the prevention of a world wide ecological disaster, requires a conscious redirection of the world economy. This can only be put into practice as a democratic program. The key monopolies and industry companies in the energy sector, in petrochemical industry and in mobility have to be taken away from private profit oriented control and have to be taken under public control. This can be achieved by various means including direct nationalization, nationalization and state control of the funding banks or similar measures. The key is to have the possibility to bring programs of controlling and redirecting flows of investment, first into public discussion and then into public and democratic decision-making. The completion of a program of sustainability requires also funds from other sectors of the economy. It should include a scheme of skimming of profits and revenues of other private and public sectors of the economy, e.g., by taxes and their redirection to the necessary infrastructure and conversion programs. This ought to and can be done while maintaining the present high living standards of the majority of the people and even improving them. The costs do not have to be redistributed to the working masses if the sustainability conversion is planned properly in their interests (see also the references in the next section).

Suggested Further Reading and Viewing

This article can only crack superficially many important issues. The Wikipedia and WWW pages in the various footnotes should provide access to the subject and can also give directions to further reading. Especially recommended is the film *The Fourth Revolution: Energy* http://en.wikipedia.org/wiki/The_Fourth_Revolution:_Energy, to get an overview on what ecological changes are technologically easily possible nowadays. The same topics are covered in the books by Hermann Scheer: *Der energethische Imperativ*, 2010; *The Solar Economy,* 2004; *The Solar Manifesto,* 2005; *Energy Autonomy,* 2006 (all Earthscan publisher), which are also highly recommendable. Hermann Scheer was a German social democratic member of parliament and devoted his live to the advance of solar energy. His books also contain politically necessary and possible measures to bring about the ecological conversion of the economy. What makes his work so valuable is that it shows how the ecological change is feasible and affordable in an economic sense. However, from the emphasis and Marxist perspective developed in this article, there are two flaws in his vision, that avert their simple implementation within capitalism. Firstly, Hermann Scheer underestimates the power of the energy monopolies which can only be broken by nationalization and democratic control. He thinks that this power of the monopolies can somehow be bypassed by relying on market mechanisms. Secondly, we argued here that the full implementation of an ecological economic program can only be achieved by the conscious direction of investments within economic planning.