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‚DEGROWTH' ALONE IS NOT ENOUGH

Why the debate about growth must align with the physical limits of the planet rather than GDP : The paths to an ecological / economic balance and how to finance them

Introduction

Can our production systems become sustainable and balanced within our existing political and economic order? This is, in principle, possible. The expected problems in financing such a transition can be overcome once the analysis is based on actual economic processes.

This paper aims to move beyond the current purely GDP-oriented debate on growth by highlighting the differences between real finiteness and the apparent finiteness of GDP. If society acts in a non-sustainable way by, for example, consuming finite fossil fuels and emitting hazardous wastes, livelihoods will be threatened, even if GDP as such does not grow. In contrast, a community that manages to preserve its environmental health will have a margin to grow, even if the growth rate is reduced in the long run.[1] This margin is determined by the ratio between the finite realities of the planet and the per capita use of raw material resources. The lower the per capita resource use, the easier a long-term stability can be achieved.[2]

Growth and finiteness have to be reconciled if we want peace and sufficiency for possibly over 10 billion people in the future. A good life with enough for everyone is a condition for social stability. To achieve this, a considerable part of the world's population in the poor countries, as well as the poorest in the rich industrialised countries, will require more goods in real terms. This part of necessary growth, requiring additional energy and raw materials, must necessarily be regenerative and resource friendly.

1. Degrowth alone cannot stop climate change

The debate about 'Degrowth' and the question of how our societies can live without growth is intensifying. And this is good, because on a finite planet there can be no infinite growth. The discussion suffers, however, from the fact that it rarely differentiates between resource-based growth on the one hand and growth on the purely monetary level on the other. This failure to understand the differences between the growth of the consumption of finite raw materials and the economic growth of the gross domestic product (GDP), defined in monetary units, regularly leads to confusion in the further analysis. The lack of differentiation is understandable, since in the past energy and raw material consumption and GDP have often in parallel. And the fact that more energy and raw materials are consumed when more products are manufactured, more roads and houses are being built, and more and more goods are being transported globally is immediately visible. Equating GDP growth with a largely analogous consumption of finite raw materials and the resulting environmental damage appears plausible. However, the fact that GDP and CO2 emissions were roughly analogous for long periods was due to the energy generation technology used - largely based on fossil raw materials - rather than by an inherent link between the two. The same applies to the industrial production of material goods of all kinds. The pollution of the environment with contaminants and the mostly irretrievable consumption of raw materials occurred because neither sustainable environmental standards nor the reuse of the raw materials were considered during the production process. The growth of GDP itself was not the problem but the way it was generated.

[1] See Schlaudt, Oliver; Wirtschaft im Kontext, Eine Einführung in die Philosophie der Wirtschaftswissenschaften in Zeiten des Umbruchs, Frankfurt am Main, 2016, S. 126 f.

[2] Herman Daly used for this magnitude problem the term ‚Scale'. See Daly, Herman; Allocation, Distribution, and scale: towards an economics that is efficient, just and sustainable; in: Ecological Economics Volume 6, Issue 3, December 1992, S. 185-193.

If, however, renewable energies are used and production of goods is carried out in an environmentally compatible production process in a circular economy, the purely monetary / economic GDP can continue to grow (at least over a certain period of time), while resource consumption is minimised.

The common starting point of the Degrowth discussion is based on the assumption that every increase in GDP is equated with an increase in environmental consumption. It is therefore also assumed that stopping or slowing GDP growth would by itself prevent an environmental disaster. But this is not the case. Climate change can only be halted at 1.5 degrees if fossil fuels (and other causes of climate-relevant emissions) are abandoned. The mere renouncement of growth in GDP is not enough. GDP is the wrong indicator, because it does not tell us where we are on the path to 100% Renewable Energy (RE) by 2050 at the latest, to which there is no alternative. It must even be assumed that the unavoidable global rebuilding of our energy generation systems will lead to a temporary increase in GDP. The insistence on a decline in GDP (Degrowth) without attention to how it is achieved may thus be counterproductive.

2. The two finiteness planes

In order to be able to separate unsustainable from sustainable growth, two finiteness levels must be distinguished. "Real finiteness" exists because the earth is a finite place, while "pseudo-finiteness" is based on monetary constraints. Both levels overlap regularly, because most economic activity is in some way connected with the use of material things. Nevertheless, the distinction is important because otherwise no statements about the action priorities can be made.

2.1. Real finiteness

Real finiteness results from the simple fact that the raw materials we need for our economic activities are limited. If a raw material is converted by its use, without its new form being able to be re-used as part of a recycling system, it is lost and will contaminate the environment as waste. This is critical, particularly in relation to the burning of fossil raw materials for energy generation. Not only the raw materials are finite but also the ability of our atmosphere to absorb the waste product CO2 (and other climate-relevant gases) without serious consequences. In order to limit global warming to 1.5 ° C our uses of energy must be completely shifted to renewables. Also, fossil raw materials are needed as the material basis for the future production of various (petro-chemical) products. This will no longer be possible once they are destroyed by one-time energetic use.[3] A circular process is possible based on a material use of these raw materials, but not once they have been burned.
Further real finiteness results from the non-expandable land that is used for the cultivation of food and for living and working. Even if renewable energies are available for an unlimited period of time (on a human scale), the space and materials needed to "harvest" the sun and wind are finite, thus limiting the amount of energy available. However, the potential for RE is large enough to guarantee a 100% supply for the foreseeable future.

[3] The World Future Council has calculated the annual costs arising from this loss at 3.2 billion US dollars. See World Future Council: The Monetary Assessment of the Non-Use of Renewable Energies, Future Finance - Policy Brief, No. 4, 05/2012

2.2. "Pseudo-Finiteness" and the GDP indicator debate

Contrary to real finiteness, the term "pseudo-finiteness" refers to all human actions, which require no additional consumption of finite goods and energy. With raw material neutrality, economic activities can grow without a limitation by material (and hence genuine) finiteness. As soon as any such action is associated with monetary payments it is recorded as income and leads to a (material-neutral) increase in GDP. An increasing decoupling of fossil fuel consumption from the growth of GDP is apparent in many industrialised countries. This trend is based to a large extent on the increase in the resource-extensive services sector vis-à-vis the raw material-intensive industrial sector. Another important reason for decoupling is the expansion of renewable energies. As long as the absolute limits of the RE are not reached, GDP can thus grow faster than energy and raw material consumption.

GDP as an indicator can only tell us how many economic transactions involving financial payments have been made. The aggregate GDP analysis cannot say whether these transactions are associated with the consumption of fossil raw materials or raw material neutrality. On the other hand, non-financial (non-market) transactions can also be associated with an additional consumption of energy and raw materials, but do not lead to a corresponding increase in GDP, because they are not recorded by the latter. Even with a stagnating or shrinking GDP, an increase in energy consumption would therefore be possible.

The GDP is the meter that indicates whether more or less good and services, wages and profits have been generated.[4] Yet, the "meter" itself is neutral. The key question is not whether GDP is rising or falling but whether more fossil fuels are consumed, and more finite raw materials are consumed. A critique of the growth of GDP is therefore only justified if it focuses on real finiteness. A growth critique that is only focuses on GDP will be increasingly misleading.

But in the long term, GDP growth cannot be completely resource neutral. It finds its natural limits in the absolute limitations of the development potential of renewable energies, even if their maximum potential for expansion is still far from being reached. The second fundamental limitation lies in the material losses in the circular economy, which inevitably will occur. When this happens depends essentially on the extent to which it is possible to technically optimize the material circles. However, a 100% closure of these circles cannot be expected .

[4] In this context, the real sequence is that higher employment rates and corresponding wage payments lead to a growth in GDP and not that growth in GDP is the cause of more employment. Taking GDP as a prosperity indicator is generally problematic, as it counts only paid work. Simon Kuznets, the developer of the GDP concept, already recognized the methodological weaknesses of his own creation as early as 1934, and warned against using it to measure the country's well-being. (See Kuznets, Simon (1934), National Income, 1929-32. Letter from the Secretary of Commerce, Senate Document no. 124. Washington: United States Government Printing Office, p.6 f.) Rejecting GDP as an indicator, however, does not help much, since all the known alternative indicators have far-reaching methodological deficiencies. The best method in practice is probably to use GDP as a core indicator and adjust for the known deficiencies.

3. The financing of the new balance: two time horizons

The GDP fixation in the growth debate also complicates the question of how to finance the transition to sustainable economic and production processes. From the assumption that GDP must fall, it is often concluded that interest and profits and consequently the entire capitalist production process are incompatible with the required transition. It is also concluded that stagnating incomes cannot generate enough savings to finance the necessary investments. But these problems disappear if GDP can continue to grow due to the restructuring of our economies.

3.1. The first time horizon: financing the conversion to a CO2-free and raw material-neutral economy

The first time horizon covers the transformation of the global energy supply to a system based on renewable energies and production systems in a commodity-neutral economy. The additional investments required for this transformation will undoubtedly lead to GDP growth. At the same time, however, these investments will lead to a permanent decline in climate-relevant emissions and the production systems will be transformed into a raw material neutral recycling system. Both should and will lead to a significant decline in the consumption of finite raw materials – in the case of burning fossil fuels to zero. Thus, in this first time horizon the paradoxical situation arises that the finiteness of raw materials is reduced by economic growth.

The purpose of first time horizon is to finance all the necessary investments, research needs and other activities required to build a CO2-free energy supply, and a raw material-neutral production and consumption structure.

The financing of investments for the conversion to 100% renewable energy and raw material neutrality can be made within the existing economic system if the framework conditions are such that the investments are profitable. The required profitability can be produced by various measures in the energy sector. Fossil fuels can be made more expensive by CO2 taxes or charges. Alternatively, a global CO2 emissions trading scheme, in which the CO2 certificates are continuously reduced to the point where a price-oriented steering effect occurs, could be introduced. For both measures success depends on the political determination to make fossil fuels internalize their full costs.

The opposite, more successful method used so far consists in subsidising renewable energies through energy feed-in tariff laws (FITS) so that they can be produced with secure returns. As soon as a government-guaranteed return was established, there were always enough investors to available. There is no reason why a viable investment that promises a secure future return should not find a lender. A bank that wants to provide a loan for a profitable RE project can create this credit itself and refinance it at the central bank. The amount of money is adapted to the credit demand and not vice versa.[5] A prior saving which results in new deposits with the bank is not necessary.[6]

[5] Cf. World Future Council: The meaning of the endogeneity of money for 'conventional' QE and the different types of 'helicopter money', Future Finance - Discussion Paper, 11/2016.

[6] The Bank of England recently stated explicitly that our real money and banking system - contrary to the representations in most textbooks - works according to these principles. See Bank of England, Quarterly Bulletin, Vol. 54, Q1, 2014

But how to finance the 100% RE target at a global level, as the revenues from CO2 taxes and emissions trading are unlikely to be sufficient, due to the lobbying powers of the fossil energy companies? The gap can be closed by the financing potential of the central banks. Central banks are able to provide practically perpetual loans (which do not need to be repaid), as the financial crisis in 2008 has shown. Thus, the necessary resources can be generated for the global RE transition. [7]

Problem Case "Stranded Assets"

Many current business models that are based on the combustion of fossil raw materials will not survive. Investors in energy companies will lose assets which have not yet been depreciated. If these have been financed with loans many companies will not be able to settle these debts and insolvencies will follow. However, capital losses due to unsuccessful business models are a feature of capitalism and can usually be handled by the overall economy if the time horizon of the loss realization is not too short. In the case of particularly serious losses, central banks can intervene and take over distressed loans from the fossil energy sector in a kind of "climate bad bank". One way to limit the effects is to involve the corresponding companies in the growing new RE business models.

The financing of the raw material neutrality through the construction of a circular economy

The conversion of our production systems to a circular model, which maximizes raw material neutrality, is still at the beginning.[8] But circular commodity economies can be made competitive against one-off use with subsequent waste disposal. One option would be to tax non-closed production processes to finance the transition to closed circular systems, e.g. the Cradle-to-Cradle model. Our current capitalist system can enable the transformation to 100% RE and circular economies if the state guarantees investment security by creating the necessary price incentives for a level playing field. Such guaranteed long-term investment security was provided by the state for virtually all the major transformations that our economy has undergone in the last two centuries. Long-term investments with government guarantees are frequent, while such investments without these conditions are very rare.

3.2. The second time horizon

When the phase of the first time horizon is completed, i.e. all global energy production is from renewables and production processes using finite raw materials are using the cradle-to-cradle methodology, the problem of real finiteness on a new level will become acute. The raw materials used for the material production of consumer goods are limited, because even the best circulating economy can never be one hundred percent closed. Not only the land for the cultivation of agricultural goods is bounded, but the space for houses, factories, schools, streets as well as railway lines etc is confined. This real finiteness compels us to forgo the growth which is connected with the destruction of finite goods in the long term, or with a growth of the energy consumptions beyond the usable RE potential.[9]

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[7] See World Future Council: Financing the 1.5 ° C limit, Future Finance - Policy Brief, 11/2016.

[8] Braungart and McDonough provide a good example for the idea of material recycling. See Braungart, Michael; McDonough, William; Cradle to Cradle, London, 2008

[9] The reduction in the consumption of energy and finite raw materials can and should, of course, begin immediately and not only after successful implementation in the phase of the first time horizon. For every energy unit that is saved,

If, in the long term, a new social well-being balance (see chapter 4.2) leads to a general state of sufficiency, it can be assumed that the desire for more and more consumption goes down. Limitations and saturations in consumption and the associated investments would lead to a very slow growth of GDP, or even to a decrease. But how can interest be generated and debts be repaid when there is no growth? For individual creditors / debtor relations, such considerations are not relevant. As long as a profitable business model exists - in which interest and other repayments are part of normal calculations - it is irrelevant how the entire GDP develops.

Neither should additional risks be expected at the aggregated, macroeconomic level. With a stagnating GDP, the demand for credit-financed investments will drop and thus less debt will be created. Another effect of lowering the demand for credit is likely to be economic structural shifts, from the capital and credit-intensive industrial sector to the capital and credit-extensive services sector. In an economy that is no longer growing materially, less additional infrastructure and less real estate will be required. If fewer loans are needed and fewer debts are incurred, the number of investment targets for financial investors will also drop, which will result in a lower interest rate. The total number of creditors / debtors will decline.

Is there a need for growth in capitalism because of interest?

The question of whether debtors are forced to aim for a high rate of growth because of (high) interest rates is often posed in the growth and degrowth debate. The answer is negative. A nominal interest rate that moves within the inflation rate and only temporarily shifts purchasing power is growth-neutral. Interest, i.e., the promise of a borrower to pay not only the amount borrowed but also interest from his (capital gain) income is part of the calculated costs. If the calculation does not work because the business model financed with the loan is failing and the debtor is insolvent, the claim of the creditor will be worthless and the credit with its interest obligations will disappear. An interest rate that is inflated will either result in less loans and debtors, or lead to a high default probability.

If there was causality from high interest rates to high (forced) growth rates, central banks would simply raise interest rates if they want to promote growth. However, they act differently because a high rate of interest does not drive but dampens growth.

Stable creditor / debtor-relations in a non-growing society

New creditor-debt relations can continue to develop. The creditors forego consumption now to make up for it later; the debtors consume more today with the intention to save more to repay the loans in the future. The overall social consumption and GDP need not increase. A positive nominal interest rate around the average inflation rate can be upheld. The transfer of purchasing power to the future is still possible for the creditors. If there are more creditors than debtors the interest rate would have to fall until there are more debtors who prefer to finance their current consumption with credit.

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the 100 percent RE target can be achieved more quickly, and every raw material unit that is not needed relieves the circular economy.

Financing in a "Fiat" money system

Even in a stagnating or shrinking economy any desired real economic activity can be financed. The real limitation comes from the number of available workers, the real available capital stock and the usable land and raw materials.[10] Within this framework, our "Fiat" money system can always be used to create the financial resources that the real economy requires regardless of whether GDP is shrinking or growing.[11]

The concept of a "Fiat" money system to free a country's economic power from the rigid gold-based corset was one of the great civilizing achievements of humanity. The prudent use of this system, with the amount of money and interest rates steered by central banks, as required by the economic situation, also provides the space for action which we now need for the ecological transformation of our production. The rescue of the financial system after 2008 was not a singular event. Central banks will have to play a key role in limiting climate change in the next decades.[12]

4. Achieving equitable and sustainable societies

Herman Daly (1972) described the pre-conditions for achieving a long-term ecological balance more than thirty years ago.[13] Two key questions need to be answered: how can the labour market be balanced without growth; and how can the social stability required to achieve a state of sufficiency be built?

4.1. The labour market

A balanced labour market is the link between the economic and social stability. This means that every employee (after a reasonable search phase) can expect to find a new job without having to accept serious wage reductions.

Most politicians call for growth in order to create jobs. These demands are usually formulated the wrong way round because new jobs create GDP and not vice versa. But the demand for more growth makes sense to a certain point, as it is based on the continuous increase in labour productivity through technical progress. Even though productivity growth in most industrialised countries has recently slowed, this increase is the basis for the increase in prosperity. Only with more work per employee it is possible to increase production and / or reduce the cost of consumer goods (with a constant number of employees). The proponents of growth know that as soon as the GDP growth rate (and thus the demand) falls behind

[10] Even in the case of a sustainable, equilibrium economy, the three traditional production factors are: active people (labour), technical equipment and infrastructure (capital), the earth and its raw materials (soil) which are only usable sustainably in a circular economy. As a fourth production factor a sustainable economic approach to the sun must be accepted. Only with this external energy, which is infinitely renewable for the human time horizon, we would be able to produce the balance of energy.

[11] "Fiat" money describes the ability of the state or its central bank to create the amount of money (in its own currency) that is deemed necessary for the functioning of the economy without any gold reserves or other rigid limits at any time.

[12] The fact that the economic dangers associated with climate change will also affect the monetary policy of central banks is now recognized by the Bank of England. See Bank of England, One Bank Research Agenda, Discussion Paper, February 2015, p. 35

[13] See Daly, Herman; The Steady State Economy, London: W.H. Freeman and Co.Ltd., 1972

the increase in labour productivity, it no longer leads to an increased production of goods, but to increased unemployment. This inherent link explains the fear of many politicians and trade unionists of degrowth.

But the increase in labour productivity can be used to reduce working hours instead of promoting further raw material and energy consuming production. This does not have to be limited to legislating a shorter working week. It would also be possible to encourage part-time work, shorten the length of the working life and extend training and sabbatical years. An increase in labour productivity implies that fewer people can produce more goods and services. But this will slow down in the future as increasing labour productivity is only possible and desirable in the industrial sector, not when providing services. Since the relative share of the industrial sector in total employment is declining due to the increase in productivity, future productivity increases will become less important for the economy as a whole.

The conversion of production processes to 100% RE and a raw material recycling economy will lead to additional demands for labour. This will be a welcome economic stimulus program for the coming decades of eco-industrial reconstruction. The advantages will be distributed globally as the conversion of our fossil fuels-based production systems is required everywhere. Building a circular economy including a large number of industries allows new jobs to be created, not only in the renewable energies sector.

The finance issue is the same as described in section 3: what is economically doable can always be financed. As long as investments are not yet profitable, the state can provide prudent (part) funding through its central bank, thus making these investments profitable and creating safe and attractive conditions for private investors.[14]

4.2. Social balance at the national and global level

If we can achieve balanced labour markets by the ecological rebuilding of our economies, a great step towards social stability has already been achieved. This stability can be defined as a state where societies compete for sufficiency with the aim of enough for all. 'Enough for all' applies both within the rich countries as well as between rich and poor countries.

This requires more equality in the industrialised countries, where the search for identity is fuelled by an unproductive run on material status and prestige goods (Tim Jackson). This growth pressure to acquire status can only be mitigated in more equal societies, because only they will be satisfied with less material production.[15] Thus not only decoupling GDP growth and resource consumption is required but also decoupling GDP and social status.

The main needs will then be non-material and social. Status will result from a multitude of personal, individual skills and social contacts some of which are conveyed through working. Interesting work can convey status even if it is not well-paid. If the identity-creating needs are satisfied thus, today's resource-intensive over-consumption acting as a surrogate for the formation of identities loses its charm. To achieve

[14] Funding by central banks is also called for by Randers and Maxton in their new report to the Club of Rome. See Randers, Jorgen; Maxton, Graeme; One percent is enough, Munich, 2016, pp. 173 ff.
[15] At the latest since the publication of Pickett and Wilkinson this knowledge should also be regarded as scientifically founded. See Pickett, Kate; Wilkinson, Richard; Equality is happiness, Berlin, 2009

this, a high minimum wage and a maximum salary level is required. 100 years ago, US banker JP Morgan said his bank would not invest in a company where the ratio of maximum and minimum wages was higher than 20: 1 as this meant that the managers / directors were promoting their own interests at the expense of the company. (www.wagemark.org)

Financing the global balance

On the global level, social balance requires that the poorer countries can catch up with the new sufficiency level of the rich countries. An important indicator is the UN's 17 Sustainable Development Goals (SDGs). To achieve these, the poor countries will need to grow significantly faster than the already well-off countries. This will be accompanied by a temporary increase in raw material consumption, which must be incentivized to reach a sustainable balance, based on circular production systems, as soon as possible.
It can be assumed that both the actual increases in prosperity and a realistic perspective in the direction of the global sufficiency level will minimize the numbers of economic refugees. Nobody leaves their home country for a dangerous and uncertain future if he or she has sufficient hope at home to improve living conditions.

Living conditions can be quickly improved if new jobs are created through the establishment of a new sustainable renewable energy infrastructure and a cost-effective energy supply is provided for all. The existence of such an energy infrastructure is also an important basis for further infrastructure improvements. The conversion of industrial production to sustainable circular systems can benefit from the technological conversion experiences of industrialised countries. In the long term, the goal should be that industrial goods (produced sustainably) are made largely in the world regions where they are used.
To achieve the speedy conversion (or new construction) of energy generation towards 100% RE and the implementation of the SDGs, a massive transfer of industrial resources from the rich countries to the poor is needed. These cannot be paid from the regular budgets of the industrialised countries, although they would create many new jobs there. Poor countries cannot afford the corresponding RE equipment imports, as the new RE infrastructure will generally not generate the foreign exchange to repay lenders.

One possible solution is a co-operation between the Multilateral Development Banks (MDBs) or other dedicated financial institutions and the Central Banks of the industrialized countries. Once the MDBs and a developing country agree on concrete project to realize 100% RE or a SDG, the MDBs would issue new standardized SDG-Bonds with very long maturities to the Central Banks. If Central Banks retain these new bonds permanently on their balance sheets, the new money thus created will be also available for 100% RE and SDG projects which are not yet profitable. This enables the financing of such projects without burdening national budgets in the industrialized countries.

For the regulation of issue and swap of such bonds, a new institutionalised framework that takes into account the interests both of industrialized countries and developing countries is required. Proposals for such a global monetary framework were made at the Bretton Woods conference in 1944 but not implemented due to national egoisms. Climate change is an unprecedented threat to human civilization and to our shared future. The chances of achieving a global solution this time have to be seized.

Final Review and Summary

The speedy global conversion to 100% RE and a circular economy is essential. This process requires a rapid expansion in the construction of the necessary RE systems. It also requires living standards in developing countries to grow to ensure global stability. On our finite planet, there is ultimately no alternative to a state of material sufficiency in which growth becomes increasingly immaterial. As the second report to the Club of Rome after "Limits to Growth" notes, there are "No Limits to Learning."
To finance this transition is possible, for whatever society can do, it can finance. New money against performance, i.e. to finance new production with un- or underutilized resources, is not inflationary. But this requires innovative policy incentives, recognizes new risk hierarchies and the need for integrated solutions to the unprecedented global challenges we face. This briefing paper aims to deepen and enliven the search for such solutions.

Bibliography:

- Bank of England, Quarterly Bulletin, Vol. 54, Q1, 2014

- Bank of England, One Bank Research Agenda, Discussion Paper, February 2015

- Braungart, Michael; McDonough, William; Cradle to Cradle, London, 2008

- Daly, Herman; The Steady State Economy, London: W.H. Freeman and Co.Ltd., 1972

- Daly, Herman; Allocation, Distribution, and scale: towards an economics that is efficient, just and sustainable; in: Ecological Economics Volume 6, Issue 3, December, 1992

- Kuznets, Simon (1934), National Income, 1929-32. Letter from the Acting Secretary of Commerce, Senate Document No. 124. Washington: United States Government Printing Office

- Pickett, Kate; Wilkinson, Richard; Gleichheit ist Glück, Berlin, 2009

- Randers, Jorgen; Maxton, Graeme; Ein Prozent ist genug, München, 2016

- Schlaudt, Oliver; Wirtschaft im Kontext, Eine Einführung in die Philosophie der Wirtschaftswissenschaften in Zeiten des Umbruchs, Frankfurt am Main, 2016

- World Future Council: Die monetäre Bewertung der Nichtnutzung von erneuerbaren Energien, Future Finance – Policy Brief, Nr. 4, 05/2012

- World Future Council: The meaning of the endogeneity of money for 'conventional' QE and the different kinds of 'helicopter money', Future Finance - Discussion Paper, 11/2016
https://www.worldfuturecouncil.org/file/2016/12/WFC_2016_Discussion-Paper_Endogenous-money-QE-and-helicopter-money.pdf

- World Future Council: Financing the 1.5°C limit, Future Finance – Policy Brief, 11/2016
https://www.worldfuturecouncil.org/file/2015/11/WFC_2016_-Financing-the-Green-Climate-Fund_update-COP22_EN.pdf

The World Future Council

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