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Degrowth and the supply of money in an energy-scarce world

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ABSTRACT

Degrowth is going to happen whether governments want it or not because, as fossil fuels run out, incomes will shrink along with the energy supply. This degrowth can either be unplanned and catastrophic or managed and relatively benign. This paper argues that three tools are essential to avoid degrowth becoming a catastrophic collapse. These are (i) a system to share the benefits from using increasingly-scarce fossil fuels, (ii) new ways of financing businesses and (iii) the introduction of debt-free regional and local currencies.

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The richer countries of the world do not have the choice of growing their economies or de-growing them. A declining fossil energy supply will force degrowth upon them whether they want it or not and their only choices will be about the way they handle the contraction. The present parlous state of the world economy is a mild foretaste of what is to come if they make the wrong decisions.

As this paper will explain, the current financial crisis was caused by the inability of oil producers to meet a rising global demand. The world's supply of oil has been flat since 2004 because the producers have been unable to bring new sources on line faster than the output from their older fields has declined. Their inability arose because oil is getting harder and harder to find and extract – BP would not have attempted to open its disastrous well 1600 metres below the surface of the Gulf of Mexico if it had had any better options. The increasing production difficulties mean that the supply of oil will soon begin to decline and that, month by month, the decline will be at an accelerating pace.

Although the output of coal and gas is still increasing, their supply will begin to contract too in a few years' time. A Canadian analyst, Paul Chefurka, expectsⁱ gas output to reach its peak in about 15 years and coal within the next five. He does not expect the supply of renewable and nuclear energy to expand fast enough to compensate and, as a result, he believes that humanity's total energy supply from all sources will begin to decline after 2025. A similar estimateⁱⁱ of the global energy supply was prepared for the 2007 Zero Carbon Britain

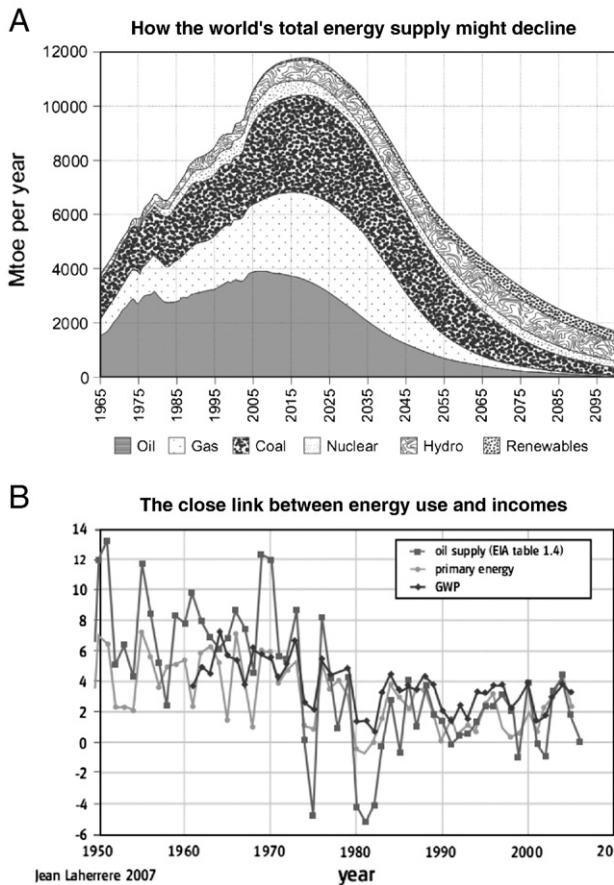
report. This showed a gentle decline in output after 2010 and a more rapid fall after 2025. Similarly, the most recent forecastⁱⁱⁱ by the oil and gas geologist Colin Campbell, one of the founders of the Association for the Study of Peak Oil, indicates that the total amount of energy available from oil and gas production will decline slightly between now and 2020 and then begin a more rapid decline.

The decline expected by Chefurka is shown in **Graph 1a**, which also indicates that he expects very little growth in the overall energy supply before the decline begins. This means that there will be very little increase in world incomes over the next decade. **Graph 1b** shows why this is the case as it demonstrates the very close link between changes in the world's oil supply, its total primary energy supply and gross world product, GWP. Accordingly, whenever the world's primary energy supply actually does begin to decline, we must expect the world's incomes and output to decline too. Degrowth will happen. Consequently, the challenge governments face is how they should manage that decline to prevent it becoming so chaotic that the economic systems on which our lives and livelihoods depend collapse because the energy and other resources required for them to adapt to much lower levels of energy use are just not available^{iv}.

An analysis of the causes of the current financial crisis can provide important insights into the changes that need to be made to financial and monetary systems to prevent the decline becoming chaotic. Let's look first at the relationship between the money supply and energy. The present money system issues money through bank debt. If

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E-mail address: richard@douthwaite.net.ⁱ <http://www.paulchefurka.ca/WEAP/WEAP.html>.ⁱⁱ Zero Carbon Britain (2007) *zerocarbonbritain: an alternative energy strategy*, Machynlleth: Centre for Alternative Technology.ⁱⁱⁱ http://aspoireland.files.wordpress.com/2009/12/newsletter100_200904.pdf.^{iv} See David Korowicz, "On the cusp of collapse: complexity, energy and the globalised economy" in *Fleeing Vesuvius: overcoming the risks of economic and environmental collapse*, edited by Richard Douthwaite and Gillian Fallon, Feasta, Dublin, 2010.

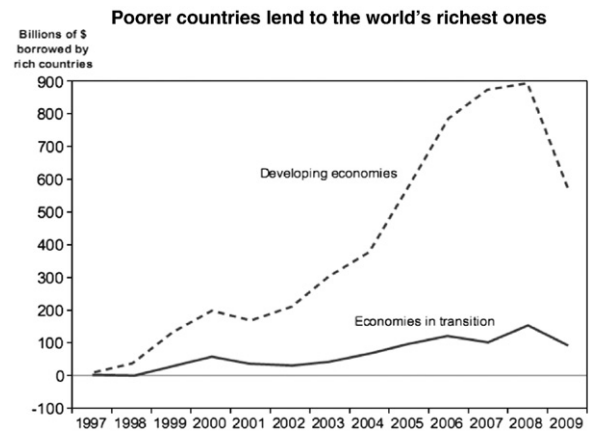


Graph 1. A. is Paul Chefurka's projection of the world's energy supply. He derived it by estimating the likely output trajectory of each major source and then adding them together. His estimate for the amount of energy likely to come from renewable sources is surprisingly small because he felt that it was unrealistic to expect that a source which currently meets only 1% of the world's energy demand would "achieve a dominant position in the energy marketplace." He continued " This is primarily because of their late start relative to the imminent decline of oil, gas and nuclear power, as well as their continued economic disadvantage relative to coal." Even if Chefurka has underestimated the renewable supply, he has probably overestimated the supplies from other sources because his projections show their gross supply and fail to allow for the increasing amount of energy that will be required to produce energy from them. Source <http://www.paulchefurka.ca/WEAP/WEAP.html>. B: The close relationship between variations in world energy use and variations in world output shown above indicates that degrowth is almost inevitable when the total amount of energy available to the world begins to fall.

someone is approved by their bank for a loan to buy something, the moment the vendor's account is credited with the borrowed funds and the borrower's account is debited, new money comes into existence in the vendor's account and is balanced by an equal but opposite debt in the purchaser's account. The new money is gradually withdrawn from the economy as the borrower repays the debt to the bank.

Until recently, if the amount of money in circulation increased because banks were approving new loans more rapidly than old ones were being repaid, more energy could be produced from fossil-fuel sources to give value to that money. This led to long periods in which the price of energy was stable in money terms, periods which were only broken when the supply of energy was artificially constrained. The sharp price rises as a result of the OPEC supply restrictions in 1973 and 1979 are good examples of the effect of supply constraints destroying a relationship between the money and energy supplies.

The commercial banks increased their lending after September 2004, thus putting more and more money into circulation. The flat oil supply meant that oil's price went up and up, taking the prices of gas, coal, food and other commodities with it. The rich world's central



Graph 2. Rich countries have borrowed massively from "developing" and "transition" countries over the past ten years. This graph shows the net flow of capital. The funds borrowed came predominantly from energy and commodity export earnings. Source: World Situation and Prospects, 2010, published by the UN.

bankers were blasé about these price increases because the overall cost of living was stable. In part, this was because lots of cheap manufactured imports were pouring into rich-country economies from China and elsewhere, but the main reason was that a lot of the money being created by the commercial banks' lending was being spent on assets such as property and shares that did not feature in the consumer price indices the central bankers were watching. As a result, they allowed the bank lending to go on and the money supply – and debt – to increase and increase. The only substantial inflation to result was in the price of assets and most people felt good about that as it seemed as if they were getting richer. The commercial banks liked the higher asset prices too because their lending was being backed by increasingly valuable collateral. What the central banks did not realise, however, was that their failure to rein in the commercial banks' lending meant that they had broken the crucial link between the supply of energy and that of money.

This break damaged the economic system severely. The rapid increase in energy and commodity prices that resulted from the unrestricted money supply meant that more and more money had to leave the consumer-countries to pay for them. The problem with this was that a lot of the money leaving the consumer-countries was not returned to them in the form in which it left. It went out as income and came back as capital. I'll explain. If I buy petrol for my car and part of the price goes to Saudi Arabia, I can only buy petrol again year after year if the Saudi money is returned year after year to the economy from which my income comes. The return can happen in two ways, one of which is sustainable, the other not. The sustainable way is that the Saudis spend it back by buying goods and services from my country, or from countries from which my country does not import more than it exports. If they do, the money returns to my country as income. The unsustainable way is that the Saudis lend it back, returning it as capital. Their loan enables my country to continue buying oil but only by getting deeper and deeper into debt.

As Graph 2 shows, a lot of the massive increase in the flow of income from the customers' economies during the boom years, became capital and was lent or invested in the commodity consumers' economies rather than being spent back in them^v. However, before the loan money became available for people to spend on petrol or

^v Obstfeld, Maurice and Kenneth Rogoff, 2009, "Global imbalances and the financial crisis: products of common causes", Centre for Economic Policy Research Discussion Paper No. 7606. argue that when global growth strengthened and commodity prices soared, the exporters generally increased their current account surpluses. This led to stronger capital flows into deficit countries which in turn increased financial sector imbalances. <http://www.econ.berkeley.edu/~obstfeld/santabarbara.pdf>.

other commodities again, at least one person had to borrow it and spend it in a way that converted it back to income. It often took quite a lot of lending and re-lending before the total sum arrived back in people's pockets. For example, loans to buy existing houses are not particularly good at creating incomes whereas loans to build new houses are. This is because most of the loan for an existing house will go to the person selling it, although a little will go as income to the estate agent and to the lawyers. The vendor may put the payment on deposit in a bank and it will have to be lent out again for more of it to become income. Or it may be invested in another existing property, so someone else gets the capital sum and gives it to a bank to lend. A loan for a new house, by contrast, finances all the wages paid during its construction so a lot of it turns into income. The building boom in Ireland was therefore a very effective way of getting the money the country was over-spending overseas and then borrowing back converted into incomes in people's pockets. Direct foreign borrowing by governments to spend on public sector salaries is an even more effective way of converting a capital inflow into income.

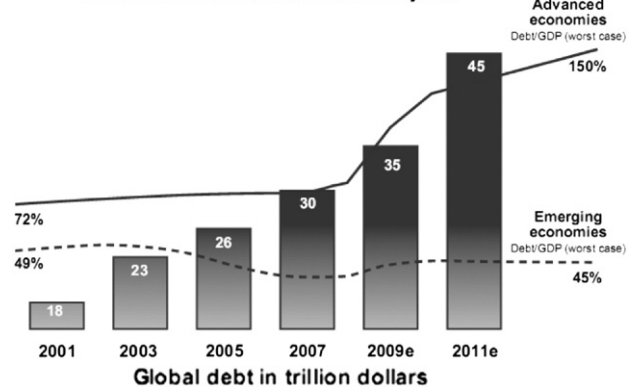
We can conclude from this that a country that runs a deficit on its trade in goods and services for several years will find that its firms and people get heavily in debt because a dense web of debt has to be created within that country to get the purchasing power lost as a result of the deficit back into everyone's hands. This is exactly why the UK and United States are experiencing debt crises. The US has only had a trade surplus for one year – and that was a tiny one – since 1982 and the UK has not had one at all since 1983.

The debts incurred by the current account-deficit countries were of two types: the original ones owed abroad and the much greater value of successor ones owed at home as loans based on the foreign debt were converted to income. Internal debt – that is, debt owed by the state or the private sector to residents of the same country – is much less of a burden than foreign debt but it still harms a country by damaging its competitiveness. It does this despite the fact that paying interest on the debt involves a much smaller real cost to the country since most of the payment is merely a transfer from one resident to another. (The remainder of the payment is taken in fees by the financial services sector and the increase in indebtedness has underwritten a lot of its recent growth.)

Internal debt is damaging because a country with a higher level of internal debt in relation to its GDP than a competing country will have higher costs. This is because, if the rate of interest is the same in both countries, businesses in the more heavily indebted one will have to allow for higher interest charges per unit of output than the other when calculating their operating costs and prices. These additional costs affect its national competitiveness in exactly the same way as higher wages. Indeed, they are the wages of what a Marxist would call the rentier class, a class to which anyone belongs who, directly or indirectly, has interest-bearing savings. A country's central bank should therefore issue annual figures for the internal-debt to national income ratio (Graph 3).

Most of the world's increased debt is concentrated in richer countries. Their debt-to-GDP ratio has more than doubled whereas in the so-called "emerging economies" the debt-to-GDP ratio has declined. This difference can be explained by adapting an example given by Peter Warburton in his 1999 book, *Debt and Delusion*. Suppose I draw €1000 on my overdraft facility at my bank to buy a dining table and chairs. The furniture store uses most of its margin on the sale to pay its staff, rent, light and heat. Say €250 goes this way. It uses most of the rest of my payment to buy new stock, say, €700. The factory from which it orders it then purchases wood and pays its costs and wages. Perhaps €650 goes this way, but since the wood is from overseas, €100 of the €650 leaks out of my country's economy. And so I could go on, following each payment back and looking at how it was spent and re-spent until all the euros I paid finally go overseas. The payments which were made to firms and people living in my country as a result of my €1000 loan contribute to its national income. If we

World debt more than doubles in ten years



Graph 3. Rich-country debt has grown remarkably in the past ten years because of the amount of lending generated by capital flows from fossil energy – and commodity-producing nations was used to inflate asset bubbles. The emerging economies, by contrast, invested borrowed money in increasing production. As a result, their debt/GDP ratio declined. Source: *The Economist*.

add up only those I've mentioned here – €1000 + €250 + €700 + €550 – we can see that my country's GDP has increased by €2500 as a result of the €1,000 debt that I took on. In other words, the debt-to-GDP ratio was 40%.

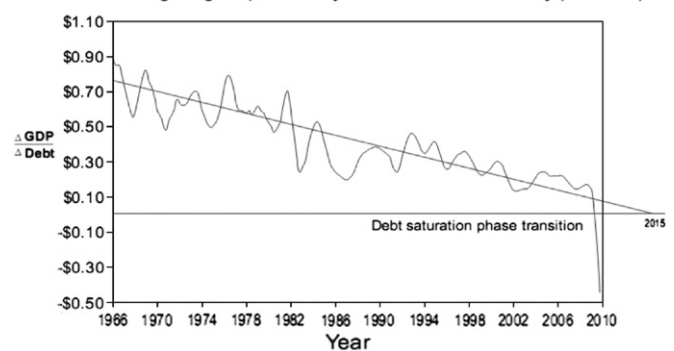
Now suppose that rather than buying furniture, I invest my borrowed money in buying shares from someone who holds them already, rather than a new issue. Of the €1000 I pay, only the broker's commission and the taxes end up as anyone's income. Let's say those amount to €100. If so, the debt-to-GDP ratio is 1000% (Graph 4).

So one reason why the debt burden has grown in "rich" countries and fallen in "emerging" ones is the way the debt was used. Because their manufacturing sectors were not generally increasing their output and, in many cases, were in decline, a very much higher proportion of the money borrowed in some richer countries went to buying up assets, and thus bidding up their prices, than it did in the poorer ones. After a certain point in the asset-buying countries, it was the rising price of assets that made their purchases attractive, rather than the income that could be earned from them. Rents became inadequate to pay the interest on a property's notional market value, while in the stock market, the price-earnings ratio rose higher and higher.

In 2007, the burden imposed on the real economy by the need to support asset prices and the debt levels that went with them became

As debt increases, US economy grows by less and less

Diminishing marginal productivity of debt in the US economy (in dollars)



Graph 4. Because borrowings have been invested predominantly in purchasing assets rather than in production capacity, each increase in borrowing in the US has raised national income by less and less. The most recent bout of borrowing – to rescue the banking system – actually achieved negative returns because it failed to stop the economy contracting. Graph prepared by Christopher Rupe and Nathan Martin with US Treasury figures dated 11 March 2010. Source: <http://economicedge.blogspot.com/2010/04/guest-ost-and-more-on-most-important.html>.

too great. The richer countries that had been running balance of payments deficits on their current accounts found that paying the high energy and commodity prices, plus the interest on their increased amount of external debt, plus the transfer payments required on their internal ones, was just too much. The weakest borrowers – those with sub-prime mortgages in the US – found themselves unable to pay the higher energy charges and service their loans. And, since many of these loans had been securitised and sold off to banks around the world, their value as assets was called into question. Banks feared that payments that they were due from other banks might not come through as the other banks might suddenly be declared insolvent because of their losses on these doubtful assets. This made inter-bank payments difficult and the international money-transfer system almost broke down.

All asset values plunged in the panic that followed. Figures from the world's stock markets show that the FTSE-100 lost 43% between October 2007 and February 2009 and that the Nikkei and the S&P 500 lost 56% and 52% respectively between May–June 2007 and their bottom, which was also in February 2009. All three indices have since regained some of their previous value but this is only because investors feel that incomes are about to recover and that this will increase the economy's ability to pay debts and maintain asset prices. They would be much less optimistic about future prices if they recognised that, in the medium term at least, a growing shortage of energy means that incomes are going to fall rather than rise.

Several conclusions can be drawn from this analysis but in this paper I am going to concentrate on three.

1. The prices fossil energy producers get should not be allowed to rise so high that they need to lend large amounts back to their customers as the growing debt destabilises their customers' economies.
2. A debt-based method of creating money cannot work if less and less energy is going to be available and incomes are going to fall as those incomes will be inadequate to support the debt. New ways of issuing money will therefore need to be found.
3. New ways of borrowing and financing are going to be required too, since, as incomes shrink because less energy can be used, fixed interest rates will impose an increasing burden.

We will discuss these in turn.

1. Limiting the price paid to fossil fuel producers

When a price goes up because something is scarce, economists call the extra money the producers make over and above its cost of production a "scarcity rent". If the world economy recovers and oil prices move up strongly again, a way needs to be found to prevent money that leaves a country as income returning to it as capital. This means that a system has to be found to capture most of the scarcity rent and distribute it as income rather than having it end up as capital in a sovereign wealth fund.

Cap and Share, a fossil-fuel emissions reduction method devised by Feasta, a think-tank based in Ireland^{vi}, would be a good way of capturing the scarcity rent. It involves placing a declining annual global cap on the tonnage of CO₂ emitted by fossil fuels and allocating a large part each year's tonnage to everyone in the world on an equal-per-capita basis. Each year, when we received that year's permits, we would sell them to a bank or post office for whatever they were worth

^{vi} See *Cap and Share, a fair way to cut greenhouse emissions*, Feasta, May 2008. Downloadable from http://www.capandshare.org/download_files/C&S_Feasta_booklet.pdf C&S should not be confused with an American proposal, Cap and Dividend (See <http://www.capanddividend.org/>) which has some similarities but confines its activities to the national level. However, Peter Barnes, who devised it, was also the driving force behind the proposal for an Earth Atmosphere Trust, which would operate a system very similar to C&S. See Barnes, P. R. Costanza, P. Hawken, D. Orr, E. Ostrom, A. Umana, and O. Young. 2008. "Creating an earth atmospheric trust" *Science*. 319:724.

on the day they were sold, just as if we were selling a foreign currency note. The purchasers would assemble the tonnage they had bought into blocks and sell them on to fossil fuel producers who would need to acquire enough to cover the emissions from their output that year.

The permits would obviously have to be scarcer than the supply of fuel to capture the scarcity rent, and as they would be distributed to everyone, not only would the money they fetched be spent as income but the poorest people in the world would still be able to purchase food and fuel as the price went higher and higher. This is important because if the distribution of fossil energy was left to the market, only the rich would be able to buy it and the food produced and distributed with it. If the poor were led to riot as a result, it would contribute to the chaotic breakdown.

The UN climate negotiations are unlikely to adopt Cap and Share because they are following a quite different route. However, something very similar to Cap and Share could be promoted by the G-20 which might set up a special agency – let's call it the Global Climate Trust. Ostensibly, the Trust would be to handle CO₂ emissions but, in reality, its job would be to allocate the use of fossil fuels around the world and thus prevent excessive competition for them causing the global economy to break down.

In effect, the Global Climate Trust would be an energy buyers' cartel which would need to get all the major energy-consuming countries to join to maximise its bargaining power. It would attempt to get countries to sign up by guaranteeing them a share of the cartel's revenue based on their population.

The Trust's legitimacy would come from its climate role rather than its economic one. Taking the best scientific advice, it would decide on the rate at which emissions from fuel use needed to fall year by year if a climate catastrophe was to be prevented. Since many climate stabilisation proposals envisage cutting fossil fuel CO₂ emissions by between 80% and 100% by 2050, it might decide that an annual roll-back rate of around 6% was required. This is not too far from the rate at which oil output might fall^{vii}.

Every year, the Trust would auction the rights to the capped amount of CO₂ from fossil fuel it had decided could be released that year. These rights would be bought by fossil fuel producers who would need to acquire enough permits to cover the emissions from the fuels they planned to sell. The Trust would have a corps of inspectors visiting oil and gas firms and coal companies to ensure that their sales matched the number of permits they had bought. The annual auctions would leave the Trust with a large pile of cash and political battles would be fought during the period in which the Trust was being set up over how it was to be disbursed. The contenders would be:

1. Compensation payments for higher energy prices.
2. A Carbon Maintenance Fee to protect soil and forest carbon stocks
3. A Hardship Fund for communities particularly hard hit by the effects of climate change or the transition to non-carbon energy.
4. Investment capital for renewable energy development.
5. The operating costs of the Global Climate Trust itself.

Let's look at the first four.

1. Compensation payments. Fossil fuel producers will have to pass on the cost of the permits they buy to their customers. As the supply of permits gets increasingly tight, their price, and thus the price of energy, will go up, taking the price of food and other necessities with it. People will have to be compensated for these rises at some basic level as, otherwise, the poor would be driven from the market and go cold and hungry. However, the basic compensation can never be enough to cover the increase in the cost of living of people

^{vii} The IEA's *World Energy Outlook 2008* reported that the decline in oil production in 600 existing oil fields was running at 6.7 per cent a year compared to the 3.7 per cent decline it had estimated in 2007.

whose lifestyle involves the direct or indirect use of a lot of energy. This group, which is made up of richer people in every country, will inevitably find that their cost of living goes up by more than their compensatory payment.

2. The Carbon Maintenance Fee. Higher energy prices would put extra pressure on the world's forests and pasture land. Unless these were protected they would be opened up for biofuel production and massive amounts of carbon dioxide would be released as a result of the land-use change. This is already happening in Indonesia where it is reckoned that when jungle growing on peatland is cleared for palm oil production, the amount of carbon dioxide released is so great that it could take over a century for it to be recovered by burning the palm oil instead of diesel fuel^{viii}. The payment of a Carbon Maintenance Fee (CMF) to reward countries which maintain the amount of carbon locked up in their soils and bogs and in the plants growing on them is therefore an essential part of any method of limiting fossil fuel CO₂ emissions. Under the CMF arrangements, a small sum would be paid annually for each tonne the country concerned had kept intact. This would be to cover the opportunity cost the country was carrying by refraining from putting the land involved to more profitable use. However, if the tonnage being safeguarded fell, the country responsible would have to buy special emissions permits to cover the amount of carbon involved. On the other hand, if a country increased the amount of carbon in its biomass and soils, it would get the special permit price for every tonne.
3. The Hardship Fund. People in some parts of the world will be especially hard hit by the effects of climate change – those in Bangladesh or the Maldives threatened by rising sea levels, for example. Other communities may need to make exceptional adjustments to cope with much lower levels of fossil fuel use. All countries, rich and poor, would be able to claim both types of assistance from this fund.
4. Energy investment. There will be calls for a lot of the Trust's annual income to be used to fund the development of non-carbon energy sources and an international fund is likely to be set up to make loans to multinational projects and to national governments for energy investments. However, it is important that communities and families can make energy investments too and, in an ideal world, part of the Trust's income would be given for this purpose.

After a lot of haggling and special pleading, the Trust would probably be mandated to pay part of the money it collected each year on an equal per capita basis to everyone on the planet to compensate for higher energy and food costs just as would happen with Feasta's Cap and Share. Most of the remainder would go to governments under the Carbon Maintenance Fee, Hardship Fund and Energy Investment headings. The residue would be retained to finance the Trust's operations which would include programmes to deal with non-CO₂ contributors to the warming effect.

The fuel producers would have to agree to work with the Trust, of course, and the incentive for them to do so would be that, although their output was reduced each year, the price paid would be increased to maintain their income. The cartel's negotiators would argue that the price that the producers got might not be any less than the average price they would receive under free-market conditions in which brief periods of very high prices would be followed by long periods of low prices as a result of the economic weakness the price spike had caused. A third advantage would be that the producers' investments in their customers' economies would do better than they would in free-market conditions.

2. The end of debt-based money

Output in today's economy gets a massive boost from the high level of energy use. If less and less energy is going to be available in future, the average amount each person will be able to produce will decline and real incomes will fall. These shrinking incomes will make debts progressively harder to repay, creating a reluctance both to lend and to borrow. For a few years into the energy decline, the money supply will contract as previous years' debts are paid off more rapidly than new ones are taken on, destroying the money the old debts created when they were issued. This will make it increasingly difficult for businesses to trade and to pay employees. Firms will also have more problems paying taxes and servicing their debts. Bad debts and bankruptcies will abound and the money economy will break down.

Governments will try to head the breakdown off with the tool they are using during the current credit crunch – producing money out of nothing by quantitative easing. So far, the QE money they have released, which could have been distributed debt-free, has been passed to the banks at very low interest rates in the hope that they will resume lending to the real economy. But this is not happening on any scale because of the high degree of uncertainty amongst potential borrowers. There are very few areas in rich-country economies where people can invest borrowed money and be fairly sure of being able to pay it back.

Some better way of getting non-debt money into the real economy is therefore going to have to be found. In designing such a system, the first question that needs to be asked is "Are governments the right people to create it?" The value of any currency, even those backed by gold or some other commodity, is created by its users. This is because I will only agree to accept money from you if I know that someone else will accept it from me. The more people who will accept that money and the wider range of goods and services they will provide in return, the more useful and acceptable it is. If a government and its agencies accept it, that increases its value a lot.

As the users give money its value, it follows that it should be issued to them and the money system run on their behalf. The government would be an important user but the currency should not be run entirely in its interest, even though it will naturally claim to be acting on behalf of society as a whole and thus the users. Past experience with government-issued currencies is not encouraging because money-creation-and-spend has always seemed politically preferable to tax-and-spend and some spectacular inflations that have undermined a currency's usefulness have been the result. At the very least, therefore, an independent currency authority would need to be set up to determine how much money a government should be allowed to create and spend into circulation from month to month and, in that case, the commission's terms of reference could easily include a clause to the effect that it had to consider the interests of all the users in taking its decisions.

This raises another design question. "Should the new money circulate throughout the whole national territory or would it be better to have a number of regional systems?" Different parts of every country are going to fare quite differently as energy use declines. Some will be able to use their local energy resources to maintain a level of prosperity while others will find they have few energy sources of their own and that the cost of buying their energy in from outside leaves them impoverished. If both types of region are harnessed to the same money, the poorer ones will find themselves unable to devalue to improve their exports and lower their imports. Their poverty will persist, just as it has done in Eastern Germany where the problems created by the political decision to scrap the ostmark and deny the East Germans the flexibility they needed to align their economy with the western one has left scars to this day.

If regional currencies had been in operation in Britain in the 1980 s when London boomed while the North of England's economy suffered as its coal mines and most of its heavy industries were closed on the

^{viii} Page, S.E., F. Siegert, J. O. Rieley, V. Boehm Hans-Dieter, A. Jaya, and S. Limin. 2002. "The amount of carbon released from peat and forest fires in Indonesia during 1997". *Nature* 420: 61. 65.

basis that they were uncompetitive, then the North–South gap which developed might have been prevented. The North of England pound could have been allowed to fall in value compared with the London one, saving many of the businesses that were forced to close. Similarly, had Ireland introduced regional currencies during the brief period it had monetary sovereignty, a Connacht punt would have created more business opportunities west of the Shannon if it had had a lower value than its Leinster counterpart.

Non-debt currencies should not therefore be planned on a national basis or, worse, a multinational one like the euro. The EU recognises 271 regions, each with a population of between 800,000 and 3 million, in its 27 member states. If all these had their own currency, the island of Ireland would have three and Britain 36, each of which could have a floating exchange rate with a common European reference currency and thus with each other. If it was thought desirable for the euro to continue so that it could act as a reference currency for all the regional ones, its independent currency authority could be the ECB. In this case, the euro would cease to be the single currency. It would simply be a shared one instead.

The advantages of the regional currencies would be huge:

1. As each currency would be created by its users rather than having to be earned or borrowed in from outside, there should always be sufficient liquidity for a high level of trading to go on within that region. This would dilute the effects of monetary problems elsewhere.
2. Regional trade would be favoured because the money required for it would be easier to obtain. A strong, integrated regional economy would develop, thus building the region's resilience to shocks from outside.
3. As the amount of regional trade grew, seignorage would provide the regional authority with additional spending power. Ideally, this would be used for capital projects.
4. The debt levels in the region would be lower, giving it a lower cost structure, as much of the money it used would be created debt free.

It should be noted that some writers on monetary systems, Thomas Greco for example^{ix}, do not believe that a non-debt money is possible. Their view is that whoever is issuing the money in question has to guarantee it in some way if it is to have a value. History shows that this is incorrect. No-one needed to get into debt or give any sort of value guarantee when wampum, the belts made from black and white shells used as money by several Native American tribes on the New England coast, in the 17th and 18th centuries went into circulation. It was enough that the supply of belts was limited by the enormous amount of time required to collect the shells and assemble them, particularly as holes had to be made in the shells with Stone Age technology – drills tipped with quartz. The person accepting a wampum belt in a trade did so because he or she knew that someone else would accept it too and would give them goods and services for it. Many other examples of non-debt monies could be given.

In addition to the regional currencies, user-created currencies need to be set up more locally to provide a way for people to exchange their time, human energy, skills and other resources without having to earn their regional currency first. One of the best-known and most successful models is Ithaca Hours, a pioneering money system set up by Paul Glover in Ithaca, New York, in 1991 in response to the recession at that time. Ithaca Hours is mainly a non-debt currency since most of its paper money is given or earned into circulation but some small zero-interest business loans are also made. A committee controls the amount of money going into use. At present, new entrants pay \$10 to join and have an advertisement appear in the system's directory. They are also given two one-Hour notes – each Hour is normally accepted as being equivalent to \$10 – and are paid

more when they renew their membership each year as a reward for their continued support. Today the system has only about 900 members and about 100,000 Hours in circulation left, a far cry from the days when thousands of individuals and over 500 businesses participated^x. Its decline dates from Glover's departure for Philadelphia in 2005, a move which cost the system its full-time development worker.

Ithaca hours has no mechanism for taking money out of use should the volume of trading fall, nor can it reward its most active members for helping to build the system up. It would have to track all transactions for that to be possible and that would require it to abandon its paper notes and go electronic. The result would be something very similar to the Liquidity Network system which Feasta has developed^{xi}.

New variants of another type of user-created currency, the Local Exchange and Trading System (LETS) started by Michael Linton in the Comox Valley in British Columbia in the early 1990s, are likely to be launched^{xii}. Hundreds of LETS were set up around the world because of the recession at that time but unfortunately, most of the start-ups collapsed after about two years. This was because of a defect in their design: they created their currencies when their members went into debt but, unlike the present money system, had no mechanism for controlling the amount of debt members took on or for ensuring that debts were repaid within an agreed time. Any new LETS-type systems that emerge are likely to be web based and thus better able to control the debts their members take on. As these debts will be for very short periods, they should not be incompatible with a shrinking national economy.

Complementary currencies have been used to good effect in times of economic turmoil in the past. Some worked so well in the US in the 1930s that Professor Russell Sprague of Harvard University advised President Roosevelt to close them down because the American monetary system was being “democratized out of [the government's] hands.” The same thing happened to currencies spent into circulation by provincial governments in Argentina in 2001 when the peso got very scarce because a lot of money was being taken out of the country. These monies made up around 20% of the money supply at their peak and prevented a great deal of hardship but they were withdrawn in mid 2003 for two main reasons. One was pressure from the IMF, which felt that Argentina would be unable to control its money supply and hence its exchange rate and rate of inflation if the provinces continued to issue their own monies. The other more powerful reason was that the federal government felt that the currencies gave the provinces too much autonomy and might even lead to the break-up of the country.

3. New ways to borrow and finance

The regional monies mentioned above will not be backed by anything since a promise to pay something specific in exchange for them implies a debt. Moreover, if promises are given, someone has to undertake to see that they are fulfilled and that means that whoever does so not only has to control the currency's issue but also has to have the resources to honour the promise should that be required. In other words, the promiser would have to play the role that the banks currently perform with debt-based money. Such backed monies would not therefore spread financial power. Instead, they could lead to its concentration.

^x Personal communications from Paul Glover and Paul Strebel, August 2010.

^{xi} See Graham Barnes, “Liquidity Networks: a debt-free electronic currency system for communities” in *Fleeing Vesuvius: overcoming the risks of economic and environmental collapse*, edited by Richard Douthwaite and Gillian Fallon, Feasta, Dublin, 2010.

^{xii} See Douthwaite, Richard, *The Ecology of Money*, Green Books, Totnes, Devon, 1999, pp.39–44.

^{ix} Greco, T. H. 2001. *Money: understanding and creating alternatives to legal tender*. Chelsea Green, White River Junction, VT. 295 pp.

Even so, some future types of currency will be backed by promises. Some may promise to deliver real things, like kilowatt hours of electricity, just as the pound sterling and the US dollar were once backed by promises to deliver gold. Others may be bonds backed by entitlements to a share an income stream, rather than a share of profits. Both these types of money will be used for saving rather than buying and selling. People will buy them with their regional currency and either hold them until maturity if they are bonds, or sell them for regional money at whatever the exchange rate happens to be when they need to spend.

These savings currencies could work like this. Suppose a community wanted to set up an energy supply company (ESCo) to install and run a combined heat and power plant supplying hot water for central heating and electricity to its local area. The regional currency required to purchase the equipment could be raised by selling energy "bonds" which promise to pay the bearer the price of a specific number of kWh on the day they mature. For example, someone could buy a bond worth whatever the price of 10,000 kWh was when that bond matured in five years. The money to redeem that bond would come from the payments made by people buying energy from the plant in its fifth year. The ESCo would also offer other bonds with different maturity dates and, as they were gradually redeemed, those buying power from the ESCo would, in fact, be taking ownership of the ESCo themselves.

These energy bonds will probably be issued in large denominations for sale to purchasers both inside and outside the community and will not circulate as money. However, once the ESCo is supplying power, the managing committee could turn it into a bank. It could issue notes for, say, 50 and 100 kWh which locals could use for buying and selling, secure in the knowledge that the note had real value as it could always be used to pay their energy bills. Then, once its notes had gained acceptance, the ESCo could open accounts for people so that the full range of money-moving services was available to those using the energy-backed units. An ESCo would be unlikely to do this, though, if people were happy with the way their regional currency was being run. Only if the regional unit was rapidly losing its value in energy terms would its users migrate to one which was not.

4. Conclusion

Up to now, the commercial banks allocated a society's money supply – they decided who could borrow, for what and how much. This determined what got done and thus the shape of the economy and society. In the future, that role will pass to those who supply its energy. Only this group will have, quite literally, the power to do anything. Money once bought energy. Now energy, or at least an entitlement to it, will actually be money and energy firms may become the new banks in the way I outlined. This makes it particularly important that communities develop their own energy supplies as part of the de-growth process, and that if banks issuing energy-backed money do develop, they are community owned.

Table 1

The world's biggest balance of payments deficits at the height of the boom in 2007.

	Deficit, millions	Ranking of absolute size of deficit	Population, millions	Deficit per head
Greece	–\$44,400	6	11.0	\$4036
Spain	–\$145,300	2	41.1	\$3535
Ireland	–\$14,120	13	4.0	\$3530
Australia	–\$56,780	4	19.7	\$2882
United States	–\$731,200	1	294	\$2486
Portugal	–\$21,750	10	10.1	\$2153
United Kingdom	–\$119,200	3	59.3	\$2010
Romania	–\$23,020	9	22.3	\$1032
Italy	–\$51,030	5	57.4	€889
Turkey	–\$37,580	7	71.3	\$527
France	–\$31,250	8	60.1	\$520
South Africa	–\$20,630	11	45.0	\$458
Poland	–\$15,910	12	38.6	\$412

It is notable that all the eurozone countries experiencing a debt crisis – the "PIIGS" Portugal, Ireland, Italy, Greece and Spain – appear in this table and that the three worst deficits on a per capita basis are those of Greece, Spain and Ireland. The countries with a shaded background have their own currencies and are thus better able to correct their situations.

Source: CIA World Factbook, 18 December 2008, with calculations by the author.

As energy gets scarcer, its cost in terms of the length of time we have to work to buy a kilowatt-hour, or its equivalent, is going to increase. Looked at the other way round, energy is cheaper today than it is ever likely to be again in terms of what we have to give up to get it. We must therefore ensure that, in our communities and elsewhere, the energy-intensive projects required to provide the essentials of life in an energy-scarce world are carried out now. If they are not, their real cost will go up and they may never be done.

Working examples of both backed and unbacked forms of modern regional and community monies are needed urgently. Until there is at least one example of a non-debt currency other than gold working well somewhere in the world, governments will cling to the hope that increasingly unstable national and multinational debt-based currencies will retain their value. Their efforts to ensure that they do will blight millions of lives, just as is happening in Greece and Ireland as I write.

Without equitable, locally- and regionally-controllable monetary alternatives to provide flexibility, the inevitable transition to a lower-energy economy will be extraordinarily painful for thousands of ordinary communities, and millions of ordinary people. Indeed, their transitions will almost certainly come about as a result of a chaotic collapse rather than a managed descent and the levels of energy use that they are able to sustain afterwards will be greatly reduced. Their output will therefore be low and may be insufficient to allow everyone to survive. A total reconstruction of our money-issuing and financing systems is therefore a *sine qua non* if we are to escape a human, social and economic disaster (Table 1).