

A critique of  
von Weizsäcker, E.U., & Wijkman, A. (with 34 collaborators) (2018)  
***Come On! Capitalism, Short-termism, Population and the Destruction of the Planet – A  
Report to the Club of Rome.***  
New York, Springer

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**Abstract**

This article offers a critique of, rather than a review of, this, 50<sup>th</sup> anniversary, report to the *Club of Rome*. The authors claim to recognise the need to radically change our way of life if we are to survive as a species. But it is not at all clear that they realise just how radical that change needs to be. One might say that their position, like that of Bruntland, is really that, with a few tweaks, we can continue to live much as we do now. And, like Bruntland and many others, they seem to believe that the necessary changes can be achieved by cumulating ad-hoc small changes. Unfortunately, virtually all such innovations have, in the past, been eliminated by a seemingly inexorable onward march of hierarchy. The position taken in this article is that the way forward, if it exists, is to be found by extending the Systems Dynamics Modelling work undertaken by the authors of *Limits to Growth* to include mapping the networks of social forces which control the *inputs* to the network of biological, physical, and economic processes they mapped and then considering the governance (socio-cybernetic systems) that are required to promote the evolution of a very different system. To facilitate this discussion, a large section of this article is devoted to providing more information about what lies behind the projections made in *Limits to Growth* than is included in the book and then illustrating how that work could be extended. Another large section of this article critiques Weizsacker et al's treatment of the workings of the financial system and the consequently misleading nature of discussions conducted using such terms as "capitalism" and "debt" in an unexamined way.

Key words: Systems Dynamics Modelling; Financialisation; Debt; Fictitious Money; Capitalism; Ecological Footprint; Governance; Wealth; Public servant; Neo-liberalism; Social Darwinism; Market process.

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Let me start by declaring my position. This book was prepared for the Club of Rome's 50<sup>th</sup> anniversary with special reference to Meadows et al's path breaking report *Limits to Growth*, published in 1972. And, for me, the most disappointing thing about this book that it fails to extend or elaborate the systems dynamics studies which lay behind that earlier report in such a way as to map the social forces which control the *inputs* to the network of physical, biological, and economic processes that *was* mapped, and from which predictions derived. Instead, it merely echoes the hundreds of exhortations based on the assumption that numerous

small alterations will effect major change that have emerged in the endless publications, including the widely cited Bruntland report (1987, but see also Trainer, 1990), that have emerged in the interim

While acknowledging the need to radically change the way we live if we are to survive as a species, the authors fail to sufficiently acknowledge the seriousness of the predicament in which we find ourselves. They fail to recognise the essentially self-contradictory nature of the very notion of “sustainable development”. They call for a new philosophy that will lead us to make less demands on the environment to guide that development. But they fail to recognise that the “solution” is, in effect, in front of our eyes: the products and services which need so much time and energy to produce and dispose of contribute little to our quality of life. The question is “Why don’t we abandon them?” instead of seeking ways of manufacturing them less destructively? To answer that question and find out how to intervene it will be necessary to undertake sophisticated sociological studies instead of offering glib answers.

The predicament, as Bill Rees reported 30 years ago, is that it would require three back up planets engaged in nothing but agriculture for everyone to live as we do in the West. Or, as one of the contributors to this book put it, it would require 4 or 5 back up planets to deliver a world in which the UN’s Sustainable Development Goals were met for everyone on the planet. Worse, as Clive Splash put it in an unpublished paper to a Degrowth conference, what they are proposing *cannot be done*. And he was not talking in ecological terms but in terms of basic physics. The outcomes of consuming energy, from whatever source it may come, do not go away. They show up as noxious gases, concrete, metal, plastics and space debris which remains to be disposed of or in further destruction of the soils, seas, and atmosphere.

As Ghandi put it “It takes all the world to feed England; how many worlds would it take to feed India?” Yet the authors of this book applaud, instead of reacting with cries of alarm to, the developments that are taking place in India and China.

And how are the changes they envisage to be brought about? Through the cumulation of individual initiatives on the one hand and more international government regulation on the other!

Unfortunately, Bookchin (1991/2005) long ago noted that the former are invariably eliminated by a seemingly inexorable onward march of hierarchy, and, as Forrester (eg 1971/2005) repeatedly pointed out, single-factor intervention in complex systems always has counterintuitive and usually contradictory effects.

Incomprehensibly, the recommendations of the Meadows team itself fell precisely into the trap of recommending centralised intervention whilst, at the same time, noting that we “lacked the political will” to introduce them. Had Weizsacker and his colleagues extended Meadows’ systems dynamics analysis to include the network of *social* forces which control the inputs to the network of physical, biological, and economic forces they mapped they might have come up with a design for a “governance” process which would rely on diverse systems-oriented, as distinct from a single-factor, system-wide, intervention. Instead they exhort us to “*come on*”; to join the crusade to add local initiatives ... whilst neglecting the social forces which have, over endless millennia, eliminated all such demonstrations of (local) feasibility.

There are many other problems with this report ... its reliance on an unexamined use of the term “capitalism”, its failure to spell out the extent of the destruction of biodiversity, the soils, the seas, and the atmosphere, its preoccupation with climate change (actually the least of our worries and already well past the point of no return), its weak treatment of population growth, its continual use of the term “market processes” without any recognition of the rigged nature of the market or the insubstantial nature of the “money” on which those processes are based, its failure to examine the way in which the tenants of Social Darwinism (in the shape of neoliberalism) have been imposed on economies, schools, and societies. It echoes the view that the role of governments is to redistribute the wealth produced through the market process when, in fact, the public service is the most important producer of wealth. By conceptualising, bending, and harnessing social forces public servants deliver more wealth than any blacksmith.

But perhaps of still greater importance is the authors’ (already noted) failure to notice, still less seek ways of undermining or harnessing, the network of social forces which lie behind what Bookchin has called “the inexorable onward march of hierarchy”. These have destroyed all previous attempts to enact the kinds of good ideas brought together in the book and others advanced through the degrowth movement. Mapping and finding ways of intervening in this network calls for the application of the tools of sociocybernetics and dynamic systems analyses in areas way beyond those tackled in *Limits to Growth*.

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Despite all this, the book does have many useful things to say. I will mention a few of them.

## **Useful insights into the state of the planet**

### *Population*

In various places, the authors say some alarming things about population growth. But then they somehow manage to deflect attention from its importance. Thus they say

The recent age of the ‘great acceleration’ clearly demonstrates that population alone does not explain the massive increase of human impact: while human numbers grew only fivefold, world economic turnover grew 40 times, and fossil fuel use 16-fold. Fish catches grew by a factor of 35, and human water use 9-fold. While population numbers are but one of the factors explaining the growing Footprints of mankind, it is crucial to increase the efforts worldwide – and not least in Africa – to encourage families to reduce the number of births.

Unfortunately, the “encouragements” they envisage seem to revolve around more education and greater urbanisation – the latter because it is very positively correlated with reduced fertility rates. Yet, it is difficult to see how these relate to the vast young populations that are emerging in Africa and India ... young people who are about to produce even more children in lands already devastated by desertification.

In this context, they fail to note that failure to tackle these pincer-like problems will result in – is resulting in – massive climate migration and conflict. Since (although they don’t admit it) it is too late to rely on stemming, never mind reversing, climate change, the problem is how to respond to the climate migration – a topic which is not discussed.

### *Ecological Footprints*

In crude terms the ecological footprint of an area is the area of land that is required to support the population living there. Thus the ecological footprint of a city captures the area required to produce the food needed to feed the population and sequester eg the CO<sub>2</sub> produced. Thus London's ecological footprint is 125 times the surface area of the city itself, which is roughly the equivalent of England's entire productive land. It would require 4 to 5 back up planets for all the world to live at the standards specified in the UNs Sustainable Development targets.

Very few countries have sustainable ecological footprints. But, interestingly enough, although it is not mentioned in this report, as Marks *et al* (2006) have shown, some of those countries also manage to deliver long high-quality lives. The report does discuss a number of very interesting developments in China, Mexico, and elsewhere which appear to have moved in the direction of redressing this imbalance.

It also notes that Smallholders make up a third of the world's population and half the world's poor, but they nevertheless produce about 70% of its food on one quarter of its farmland, and that mostly without inflicting severe ecological damage. They are nevertheless being dispossessed and displaced at an alarming rate, mostly with government approval. Yet commercial agriculture is the most costly business with dramatic negative profit margins if the external costs are added to mere production costs.

### *Toward sustainable living arrangements.*

The authors of the report summarise the writings of a number of authors, but perhaps those dealing with *Natural Capitalism* which, they say, uses all resources more productively, and *Regenerative Management*, the laudable principals of which are summarised under eight heads, come across as the most important. Great hopes are also attached to holistic management and holistic decision making and compelling examples of what can be achieved through these processes in Mexico, Arizona, and Zimbabwe are given.

In fact, they give so many examples of what is possible that I was lulled into a comfortable feeling of optimism until I was pulled up sharp by a statement which says that "Germany has pledged to be 100% renewable by 2050".

Now. That cannot be. Such a statement cannot possibly mean what it appears to mean ... and it contributes to the exaggerated sense of optimism which pervades the book.

What about the consumption of the aviation and marine fuels required to transport passengers and ship vast quantities of food and other goods from China and elsewhere into Germany? Should these not be included in statements about the fuels used "in" Germany? What about the energy devoted to military activity, surely most of that cannot come from renewables. When I looked at the figures some 30 years ago, the military contributed more than any other sector to energy consumption and the despoliation of land. Can this be replaced by electric tanks and missiles?

And. OK. One can use electricity to manufacture plastics for doors, windows, car bodies and so on. But the oil (fossil fuel) is still being consumed. And disposal of the products so manufactured must itself consume vast amounts of energy.

And what about the coal involved in the manufacture of the steel, concrete etc used in the construction of airports, buildings, and roads?

And what about the mining and refinement of the under-priced rare earths needed in electronic equipment and wind generation? Not *in* Germany but absorbed into Germany.

What about the cooling and cleansing of the vast amount of water used in manufacture of computers?

And, then again, it is not energy *consumption* ... but what about disposal of the products of consumption: heat, manufactured goods – computers, space labs etc? In which context it is worth noting that “recycling” essentially doesn’t work: Huge plants are deployed to separate plastic, metal, paper etc. but, in the end, very little is actually re-used or re-cycled: most goes to landfill or sea-fill.

Such reflections jolted me not merely into scepticism about Germany but also about other things that are said throughout the report and, more generally, into remembering the problems with reductionist science as highlighted, in particular, by Vandana Shiva. What is *missed out* in all these apparently positive evaluations? What are the disbenefits?

And then there is this extraordinary thing. The authors suddenly applaud the relative efficiency of rail and highway systems that are able to transport millions more commuters and vastly more goods each day and, indeed, seem to wish to promote such developments. Pardon. Surely, if the aim is to promote degrowth, the problem is to get rid of these things. Vast numbers of office workers make a daily commute into London in order to spend their days using huge numbers of ecologically destructive computers to promote and organise the manufacture and marketing of trade and services which confer few benefits on those who purchase them and to engage in financial transactions that have little, if anything, to do with quality of life.

Nothing could better underline that this book is, after all, about nothing more than creating the impression that, if only we will make a few tweaks, it will be possible for us for us to carry on pretty much as we do now.

#### *Public Management and Governance systems.*

It is a strange fact that, while, in a sense, promoting world management via a (distorted view of) the market process, and while underlining the need for more intervention to correct the dysfunctions produced by that process, neither this book nor others I have read, note the enormous role played by governments in managing modern economies. (In all countries of the EU central government spending amounts to 45% of GNP and this figure rises to about 65% when local authority expenditure is included). Nor do they note the need for radical reform of the centralised public management processes orchestrated through so-called “democratic” process to create the pervasive climate of innovation and learning that is needed to move us toward a different kind of society or even manage public-sector activities like education and health care more effectively.

Given that there are endless criticisms of the workings of the European Council and Commission and the G8/G20 this is indeed extraordinary.

The closest this book comes to saying anything of the sort is to note that, while the reach of market process extends worldwide, what they call the balancing social, moral, and legislative processes that, they say, Adam Smith deemed essential to the effective operation of the market process are the preserve of individual countries. Yet the changes deemed necessary to

redress this imbalance – more centralisation – are sufficient to send shudders down one’s spine.

But what of this “balancing” process? Discussion is limited to a couple of sentences the effects of which are promptly diminished by commenting that the role of the market is to produce wealth and that of government to redistribute it.

In reality, as already noted, public servants are the most important *producers* of wealth ever known. By conceptualising, bending, and harnessing social forces, determining prices (by, for example, deciding which components of a cost are to be contributed by the particular producer or distributor and which spread over the whole community<sup>1</sup>), building infrastructure, and delivering education and health care, they generate more wealth than any blacksmith. We will return to this question later: it is, in reality, the most important issue the authors might have addressed – and they might have been able to do so had they extended the social dynamics analyses contributed by Forrester and Meadows.

This is, in truth, an extraordinary oversight – for public servants *manage* the market process. They determine prices (much more fundamentally than most people realise), tariffs, and taxes. Farmers farm grants, not fields. When all CO2 emissions arising in the production, running, and disposal are included, electric cars confer only marginal savings. But each car costs the taxpayer a couple of thousand dollars. In such ways public servants manipulate the apparently purely mathematical calculations of economists. They essentially *create* the tax havens which enable corporations to move their registered offices to places where they pay no tax and arrange the nominal prices of goods nominally shipped between destinations so that, on paper, they only make a profit in the “tax haven”.

Given all this, what do the terms “capitalism” and “market process” as used throughout this book actually mean?

And why has so little attention been paid to the governance process itself?

### **The Quest for an Alternative Philosophy or World View**

Somehow, the authors try to convince us that we need a new philosophy – a new enlightenment – to guide our actions. They trace the first articulations of our assumption that man should dominate nature to Greek and Abrahamic traditions and then more modern misinterpretations of the writings of Adam Smith, David Ricardo, and Charles Darwin. They call for us to live in a more balanced way with nature, noting in passing that the Hopi in North America created a high-quality civilisation which remained stable and sustainable for 3000 years.

Yet, while agreeing that the tenants of “neo-liberalism” have become hegemonic, pervading everything we do, constraining most of our actions, and rendering alternative thoughtways literally unthinkable, and while acknowledging that the authors do mention the work of the Mont Pelerin Society (see eg Fink, 2016, for an account), they somehow fail to recognise the brute force with which the notions of extreme Social Darwinism (it is right and

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<sup>1</sup> The apparent efficiency of centralised production and distribution centers is almost entirely dependent on allocating transportation, highway, policing, the hospitalisation costs arising from accidents and the costs of refuse disposal to the wider community.

proper ... and, indeed, an iron law of nature ... that only the most competitive should survive) have been imposed on schools, societies' welfare systems, and trade between and within countries. Thus there is, for example, no mention of the extraordinary network of activities through which Milton Friedman succeeded in introducing such developments into public management systems worldwide (see eg Klein, 2007)<sup>2</sup> and no mention at all of the activities of Bilderberg group or those who own the private banks which constitute the US Federal Reserve Banks. Indeed the very idea that such interventions might have taken place is somehow marginalised by suggesting that the changes which came about in the 1970s and '80s were largely attributable to the oil crisis (without any mention of how or why that crisis was manufactured).

The discussion of trade, while reluctantly acknowledging some of the problems with the idea, nevertheless continuously overlooks the fact that there *is* no such thing as "free trade": As we have seen, prices are primarily determined by public servants and, as Klein shows, if all else fails, enforced by legal and military intervention.

### **Workable Improvements**

Whilst implying that, with a few – well, actually, a considerable number, of – tweaks, we can continue to pursue "economic development" (somewhat redefined), the authors do note that, in order to reach the UN's sustainable development goals, it will be necessary to exceed the current climate targets and make it impossible to stem global warming (and the massive climate migration that that implies), let alone stem the destruction of biodiversity, the soils, seas, and atmosphere. Their solution is to re-define "economic development" – but they nowhere indicate that the kind of political-economy that is needed would not even be recognisable as any of the arrangements to which those terms are applied today. Amazingly, they do not seem to have understood that the goods and services we spend so much time producing and disposing of add little to the quality of our lives. But, perhaps lurking behind the failure to mention these things lies a fear of what would happen if these occupations were dispensed with. Satan finds work for idle hands and the outcomes of his activities are perhaps represented not only in the proliferation of senseless work (see Bookchin, 1995/2001, and Graeber, 2013), the activities that constitute the "financialised economy", and the growth of pointless "education" but also in the extraordinary battles and inquisitions being fought in, and advanced by, the "social media".

### **The Financialisation of the Economy and "Debt".**

There is an extensive, and at times informative, discussion of the finance-based (as distinct from goods-and-services-based) nature of our current economy. But the discussion is somewhat disjointed and reads rather like a student essay written by someone who has searched the internet for relevant material and strung it together without reflecting too deeply on the issues.

Here are a couple of examples:

Prior to the collapse of communism in 1989 the most powerful private sector actors included the mining, manufacturing, and service sectors alongside the banks and insurance companies. But by 2011 45 of the top 50 international corporations were not producing goods or services at all. But were banks and insurance companies.

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<sup>2</sup> Interestingly, so far as I know, Friedman himself did not profit hugely from his interventions.

This brought with it directions from the financial sector to the manufacturing and other sectors on the minimum returns on investment that they must achieve.

...

In the United States both household debt and private sector debt more than doubled relative to GDP between 1980 and 2007. The same is true for most OECD countries. At the same time, 'the value of financial assets grew from four times GDP in 1980 to ten times GDP in 2007 and the finance sector's share of corporate profits grew from about 10% in the early 1980s to almost 40% by 2006.

...

In 2010, the volume of foreign exchange transactions reached \$4 trillion per day', which does not even include derivatives. In comparison, 'one day's exports or imports of all goods and services in the world amount to about 2% of those \$4 trillion'. Transactions *not* paying for goods and services, almost by definition are *speculative* ie making money out of purely financially-based increases in the value of money itself without making any contribution to the production of goods and services.

And among these speculative transactions are those associated with pension companies the value of whose "assets" (and the pensions they can thus promise to pay) are continuously inflated via Ponzi schemes dependent on continuing investments from customers and projected returns from fossil fuel extraction that cannot be reached if current climate change commitments are to be met.

These observations are horrifying in themselves and point directly to the need, if one believes in economic development, to require the banks and financial institutions to decrease the funds available for such speculation and increase investments in the productive economy.

But look at what is happening here.

One has to wait another 140 pages before the authors get round to saying that

While mainstream economists – and the public – appear to assume that lending is financed primarily by savings, this is manifestly untrue. Banks create money in the act of creating debt – to a large extent out of thin air.

It is not at all clear to me that the meaning of that statement will be apparent to most readers - or indeed that the implications are clear to the main authors of this report.

What it means is that the money supposedly "lent" by the banks – and, these days, much more importantly, a huge number of other financial institutions – did not come from anywhere. It did not come from any savings account and it was not withdrawn from, or denied to, any other productive activity. It simply did not *exist* before. So the true rate of interest is infinite, since anything divided by 0 is infinity. Thus there is therefore *no* "debt" in the sense in which that term is commonly understood and the continued use of the term in discussions such as this thus only contributes to confusion.

The use of the phrase "*private sector* debt" further confuses the issues. The term "private" is used to distinguish money created by non-banking financial institutions from money created by banks and governments.

That money is then lent to other people (mostly other institutions) who then use it as an asset on the basis of which to borrow further fictitious money to make still more money out of what are in effect Ponzi schemes.

And, make no mistake about it, the scale of the activity producing this so-called "private sector" debt (better termed privately created stack of fictitious money) entirely dwarfs money created by banks and spent by governments (the latter being mostly on "servicing debts" but



otherwise usually on goods and services such as health care, education, and military operations).

Note what all this implies for the meaning of the term “capitalism”. What we have here is investments of vast amounts of money created by dispersed financial institutions and spent by myriads of other people and institutions to make money out of money ... not out of the production of goods and services. The bears little resemblance to the kind of capitalism usually conjured up by the term.

What kind of “capitalism” is this? How has it come about? Is it a product of the operation of a more or less invisible network of social forces? If so, how are these to be mapped and harnessed? Or is it the result of some kind of conspiracy by eg the previously mentioned members of the Mont Pelerin Society or engineered by Milton Friedman (who, interestingly enough, is never mentioned in this book despite his extraordinary role in legitimising and imposing neo-liberalism, better understood as social Darwinism, on country after country) or those who own the US Federal Reserve banks, which, contrary to popular belief, are not public institutions but private banks owned by not more than 300 people in total? How was the de-regulation orchestrated? (Note that it varies between countries with the result that corporations move money between jurisdictions and play one country against another). How is it to be restored and extended? Through what kind of world governance organisation(s)? While Weizsacker et al rehearse the “obvious” recommendations for regulation of finance-creation and the way the “money” so created is to be spent, the question of how such regulation might be introduced is not discussed ... apart from a passing references to Randers’ observation that it is difficult to see how it could be done in a democracy.

And when the authors turn their attention to proposing ways of fixing the situation they continue to be misled by failure to realise how deeply the banking system is entrenched in the ownership and management of the world (Raven 2015).

The immediate challenge will be to stimulate the banks to create money for real investments rather than for excessive speculation in different types of financial assets and consumer or real estate credits.

Actually, there is no need to “create” it: more than enough has been created. The problem is to influence the way it is deployed.

In this context the authors echo one of the most widely disseminated errors about the role of the banks in the last financial “crisis”. They talk about the banks having irresponsibly created and lent vast amounts of money to borrowers who were likely to default on repayments and then having to be “rescued” by governments. What this fails to say is that the money supposedly needed to rescue the banks was, to all intents and purposes, created by those very same banks and then lent to governments in such a way that taxpayers were left having to pay interest on that fictitious money. And that, in order to free up money for this purpose, governments were induced to introduce austerity programmes, cut public spending, and sell public assets to the banks’ owners!

The authors go on to explore the possibility of fixing the problem by extending banking regulation, noting that this would necessitate *international* regulation and thus authoritarian international structures.

Disturbingly, however, as previously mentioned, the authors do not seem to fully recognise the embedded nature of the banking structure and the problems this poses for (re)introducing regulations.

Another thing. The authors more or less ignore the implications of this financialisation for the enforcement of hierarchy and exclusion from society. They speak about the problems posed by inequality and need to fix it. But they do not seem to recognise how vicious inequality is exacerbated by the flow fictitious money. Explicitly making money out of purely financial transactions is largely an activity engaged in by the few. Yet it has enormous implications for differentials within the economy *among those who never engage in any such transactions*. For example, if an ordinary middle class individual invested £500 in purchasing a house in 1960 and sold it and bought another a couple of times in his lifetime that £500 would show up as a house worth £1.5 *million* today. This without its owner having made any improvements to his properties in the course of his life. Of course, in a sense, he is no better off because he would have to spend about £ 1.5 million to buy the house he had in 1960. But the difference between himself and another citizen who had not invested in property would have increased enormously. The result is exclusion of vast numbers from housing and the erosion of leisure as more and more struggle to find the money they need for their housing and spend more and more of their lives imprisoned in debt-incurring “educational” institutions.

And note this: whenever those who create and lend the fictional money used to buy a house lend that money they insist that the recipient sign away their ownership of the property should they default on repayments. In this way those who own the banks and financial institutions have acquired a lien on vast amounts of property, including government and commercial property, and will acquire outright ownership of that property in the event of a financial crash and the resulting defaults in payments. In other words, this process will accelerate the ownership of the world by the few.

### **Countering the *Limits to Growth*.**

As indicated earlier, my main complaint about this book is that the authors have not followed through, along the lines pursued in the analyses presented in *Limits to Growth*, to map the network of societal forces that generate the human *inputs* to the biological-ecological-economic network of interactions they map.

My claim is that, had they done so, it would have enabled them to come up with proposals for an alternative, socio-cybernetically-based, public management system that would have enabled them to move beyond the earlier statement that “we lack the political will” to introduce the changes deemed necessary to overcome the problems we face. (As noted, this feeling of defeatism is reinforced in this book by quoting Randers as saying that the necessary changes cannot be introduced in a democracy.) To be more precise, my claim is that, had they taken this route, it might have enabled them to help us to envisage a multiple-feedback socio-cybernetic *system* (as distinct from some form of command and control operations) which would enable us to move toward the radically different way of life that is clearly necessary but cannot currently be envisaged. I am talking about arrangements which would enable us to *evolve* a very different, sustainable, way of life.

This cannot be some variant of “democracy” in which people vote for things they cannot envisage. It has to do with evolving, enacting, comprehensively evaluating, and subsequently pursuing a diverse a range of activities grounded in different forms of expertise.

So let me summarise some of the things that the authors of *Limits to Growth* actually did do because, as it happens, these are not, in fact, fully spelt out in the 1972 report - in part because they are seriously technical. And, to confess, what they actually did do did not become clear to me until a colleague introduced me to the on-line, interactive, versions of the procedure that are now available via Vensim (Meadows *et al*, 2008)

They started by generating a map or model of the network of interactions between the biological, physical, and economic processes which result in such things as pollution and population growth.

Such maps are now becoming widely known as *dynamic systems models*.

What differentiates a *dynamic* systems model from a static, systemogram-based, map of the same processes is that it picks up, and reveals, all the effects of all the interactions that occur as any or all of the components change.

The authors of *Limits to Growth* use this model to generate graphs showing what would be likely to happen in connection with a number of key outcomes over the next 50 years if a number of specific steps were taken to do such things as conserve resources or limit pollution.

Here is their world model of the interactions which occur between the various biological, physical and economic components of our world.

The various symbols embedded in it signify such things as opportunities to control the flow along various loops ... but it is not necessary to understand them from the point of view of understanding my argument here.

Although the following diagram goes off screen here, when printed it prints sideways on the page.

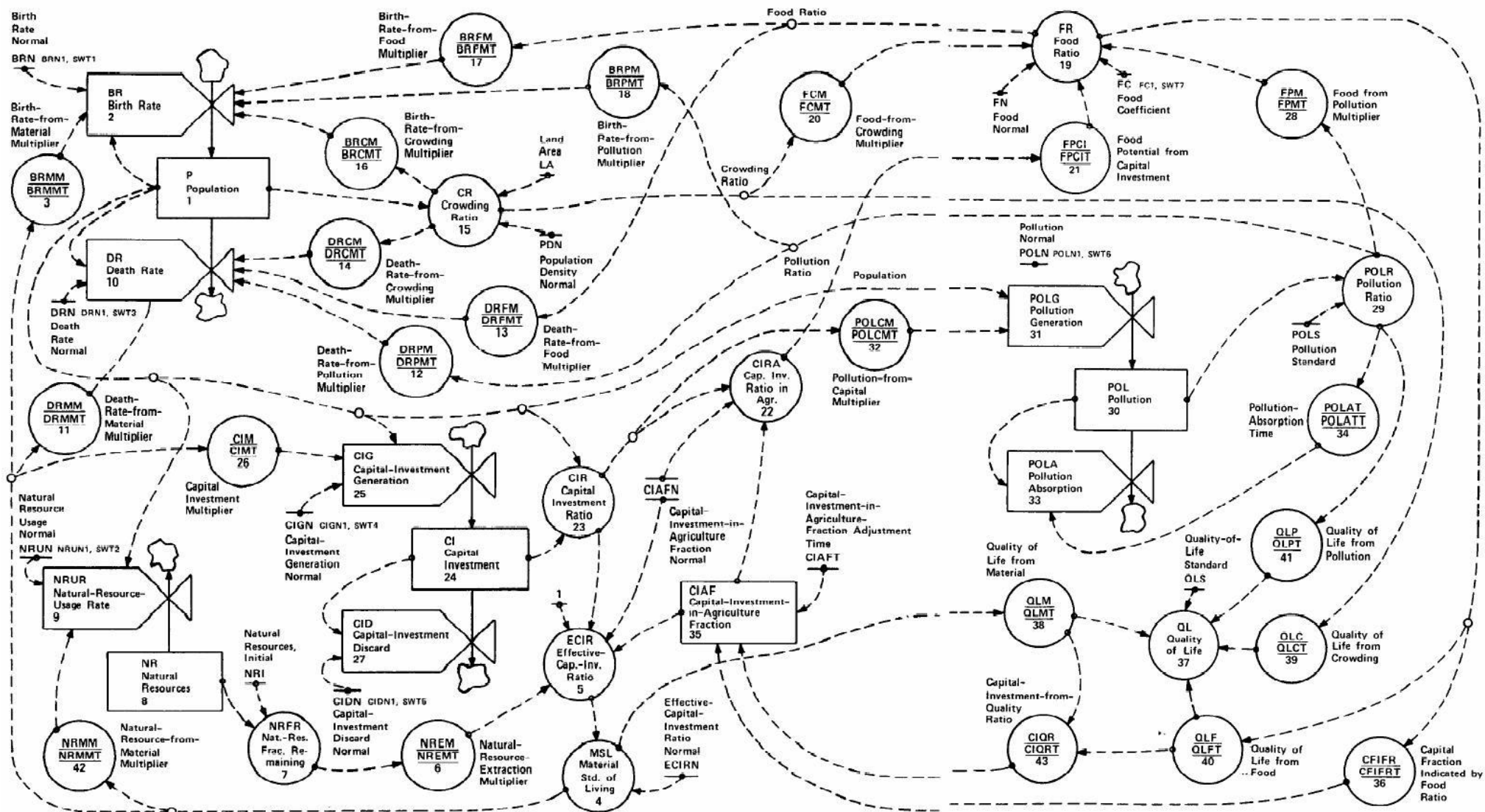
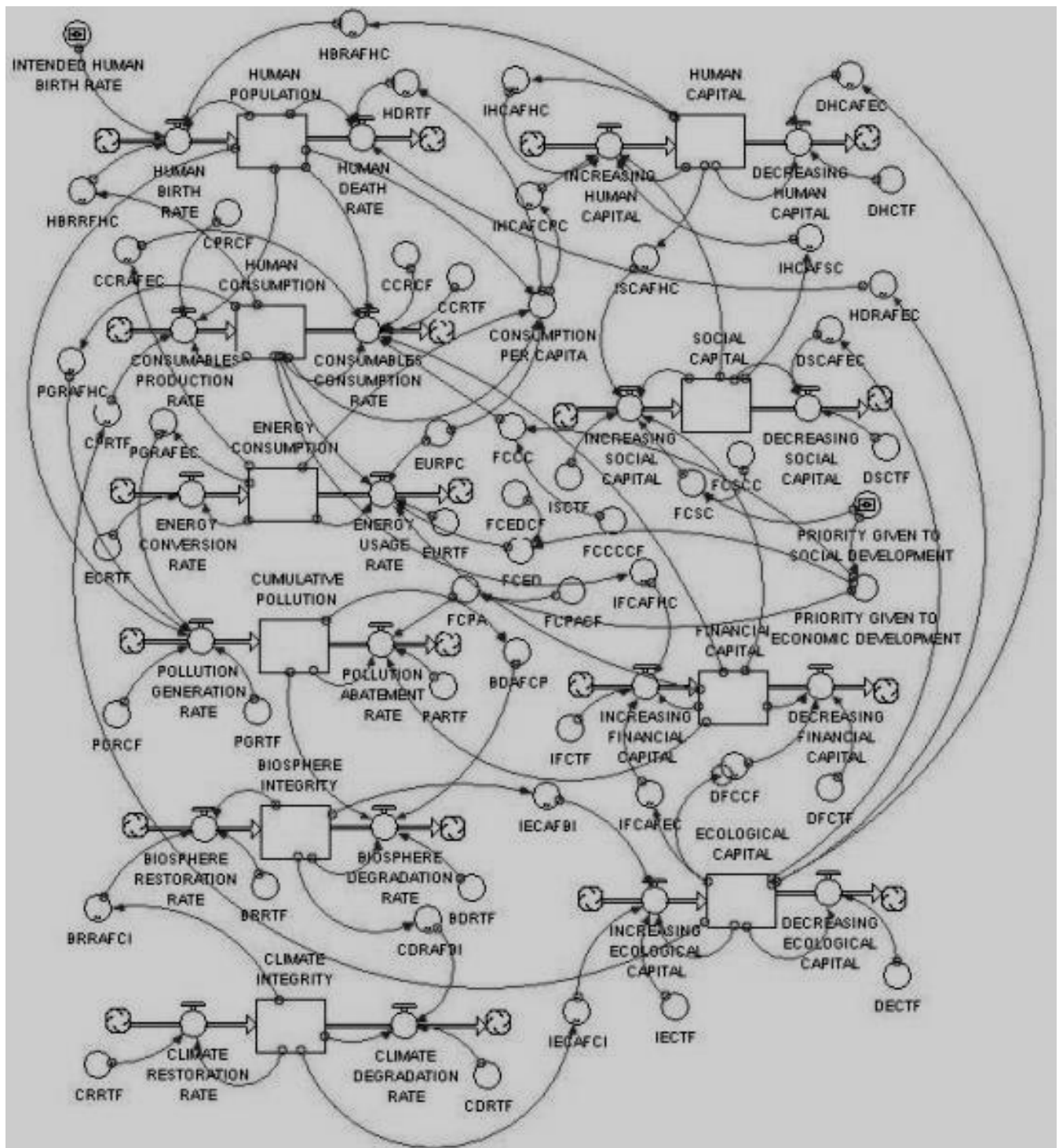
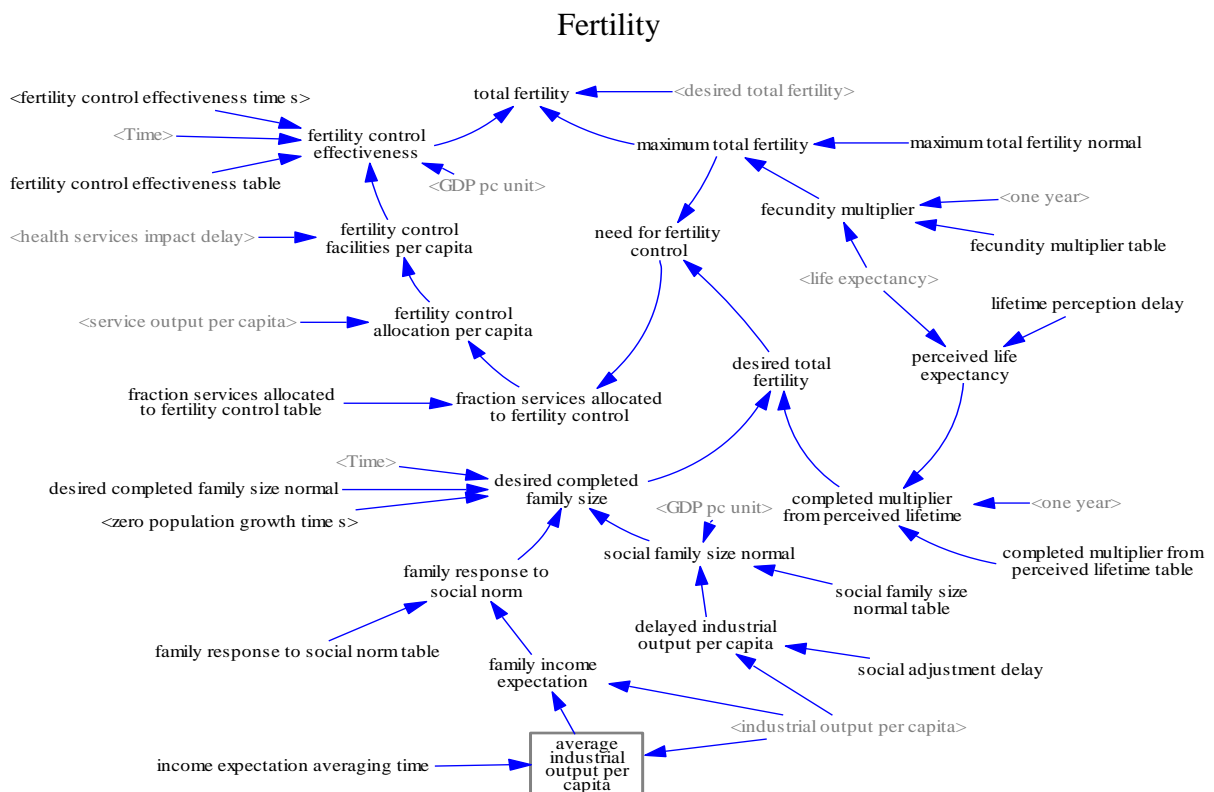
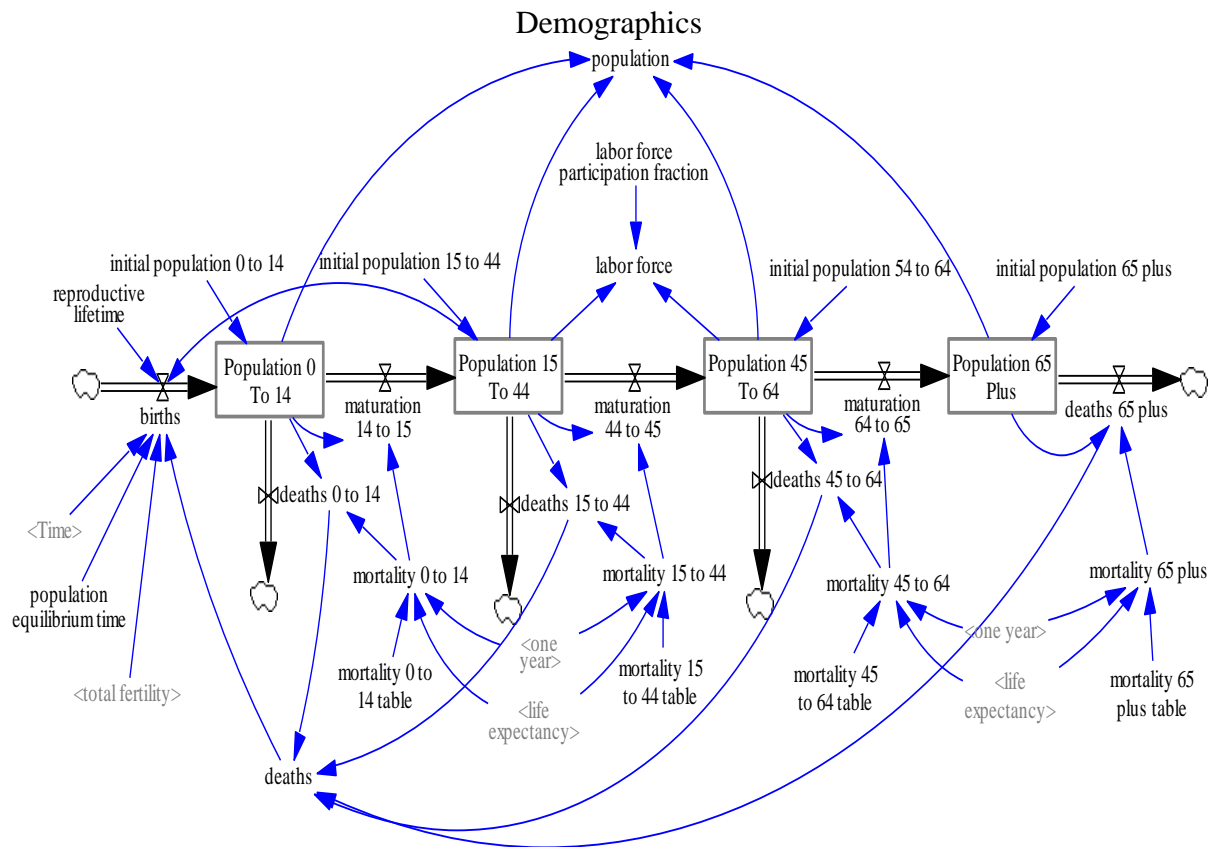


Fig. 10 Simplified World Model used to analyse the effects of changing population and economic growth over the next 50 years. The model includes interrelationships of population, capital investment, natural resources, pollution, and agriculture and background variables which influence, and are influenced, by them.

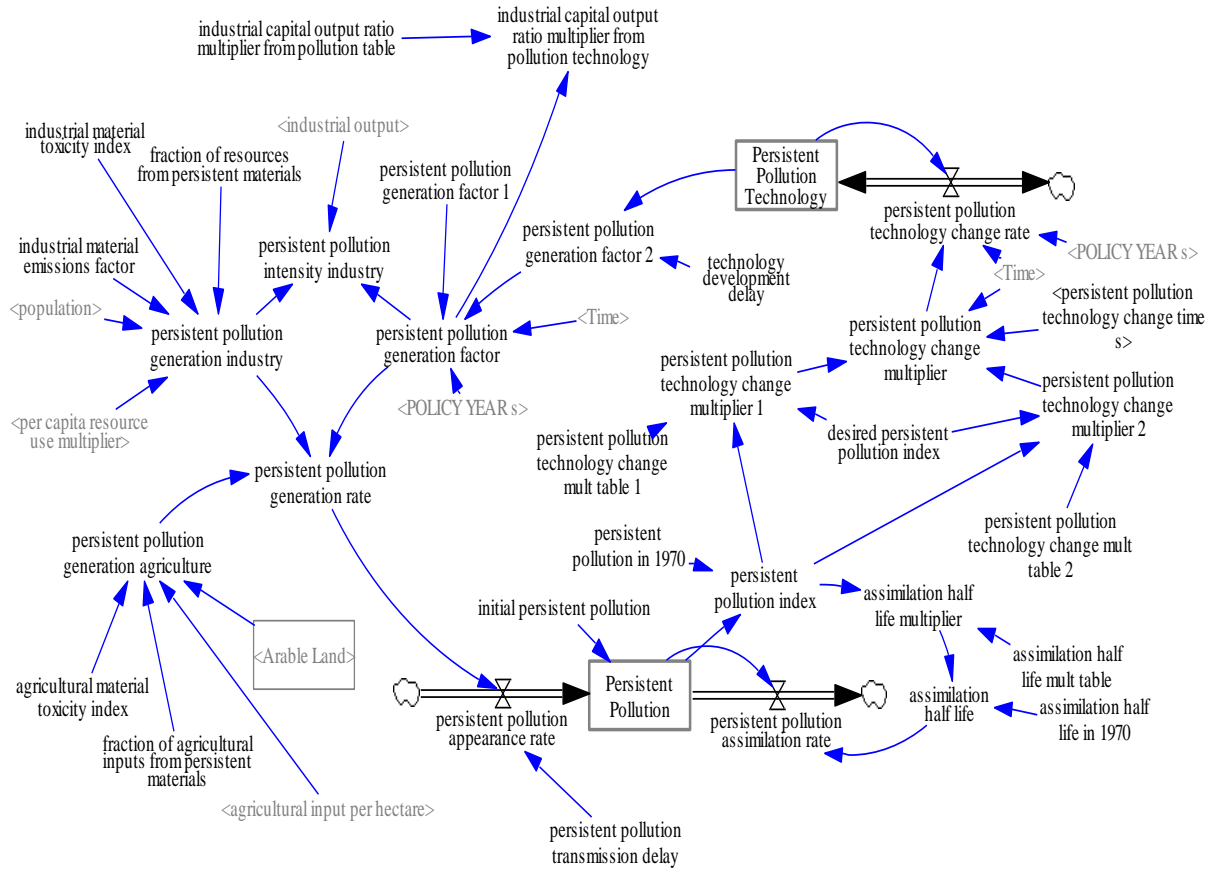
Some readers may be troubled by such things as the fuzziness of the actual printing in the Figure. So here is a sharper world model, although not one used by Meadows *et al.*



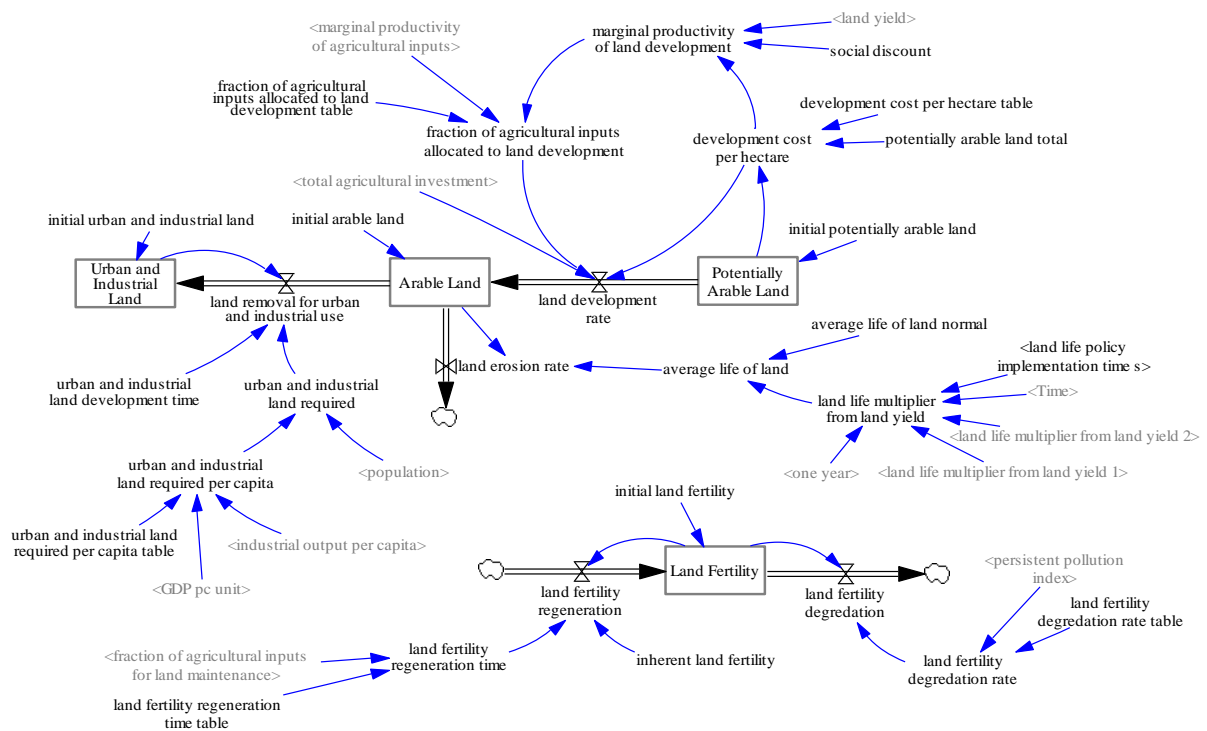
Behind the Forrester/Meadows overall model lay a series of more detailed models in each area. Here are a few examples:



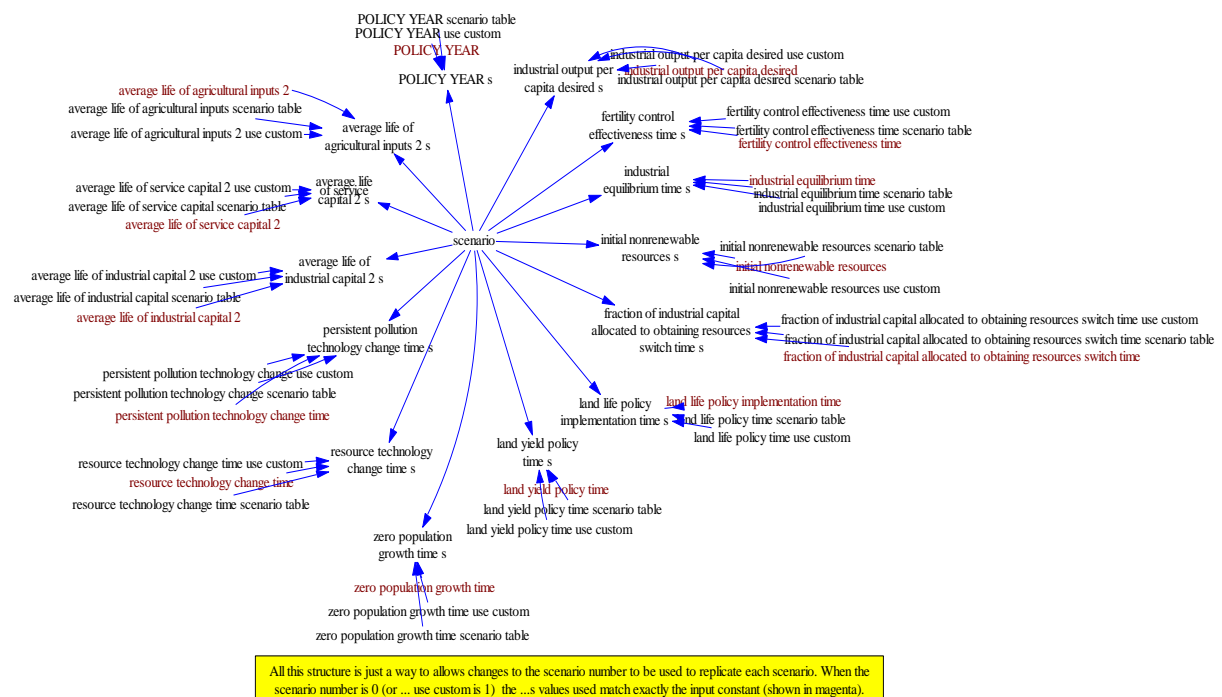
## Persistent Pollution



## Land Development Loss of Fertility



These sub models were then combined with the main model using the following network to generate the range of projections of what would happen if some of the main inputs were changed that were included and discussed in *Limits to Growth*.



A number of predictions derived from the model were published in *Limits to Growth*. Figure 2 shows what the model predicted would happen to a number of key indices of the state of the planet if things were left to go on pretty much as they are.

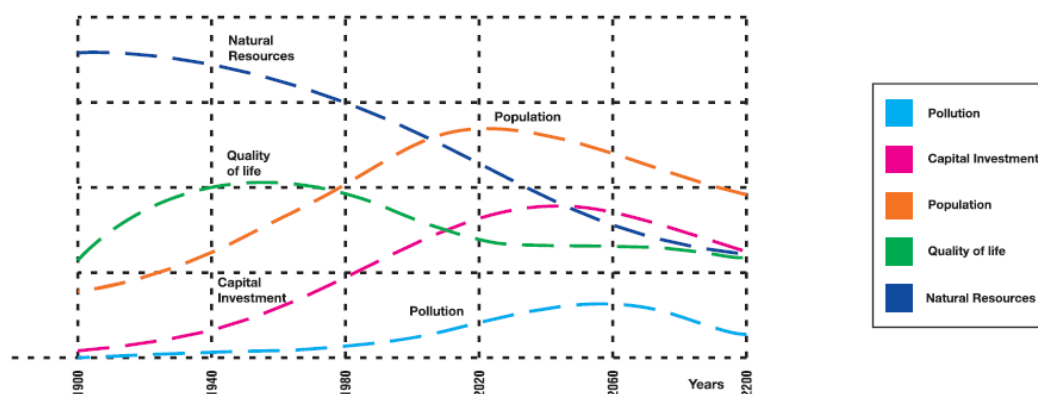


Fig. 2. Natural Resources; Population; Quality of Life; Capital Investment; Pollution.



One “obvious” solution to the problem is to find ways of using resources more efficiently. But, as Figure 3 shows, it turns out that this produces a pollution crisis which exterminates us even more quickly than just leaving things to evolve as they will.

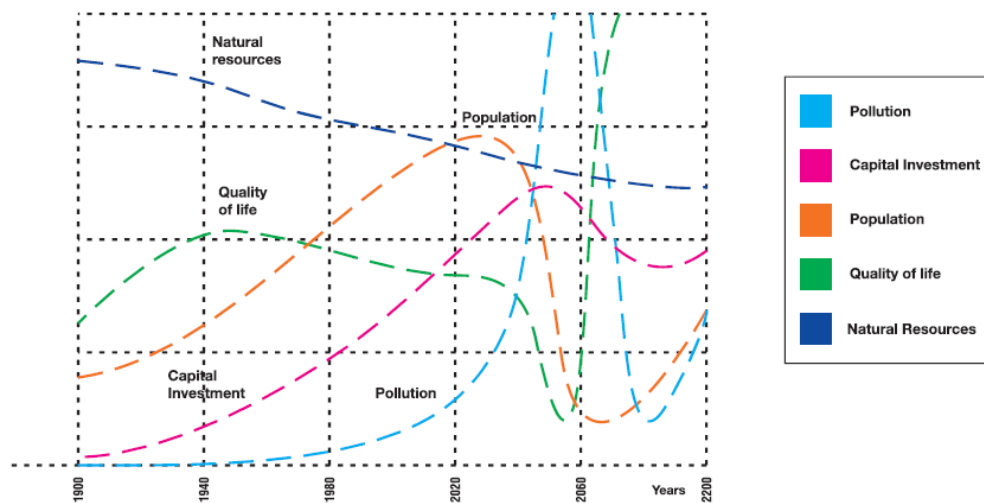


Fig. 3. A pollution crisis is precipitated by lower usage of natural resources. In 1970, natural resource usage is reduced 75 per cent by more effective technology without affecting material standard of living. The Pollution crisis produces a dramatic drop in population.

Figure 4 shows what was expected if the rate of capital accumulation was increased by 20% in an effort to stem the reduction in quality of life. A pollution crisis is precipitated and this results in a rapid decline in population.

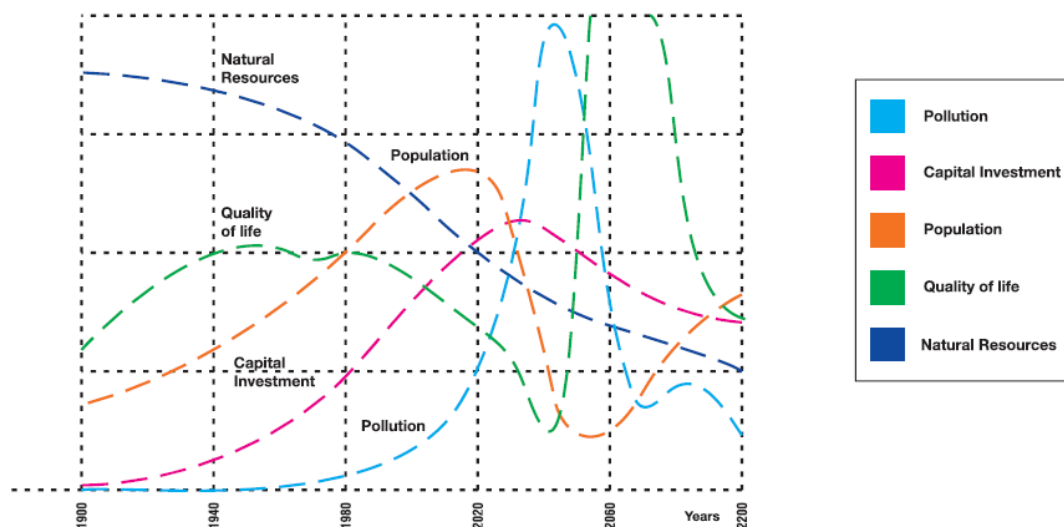


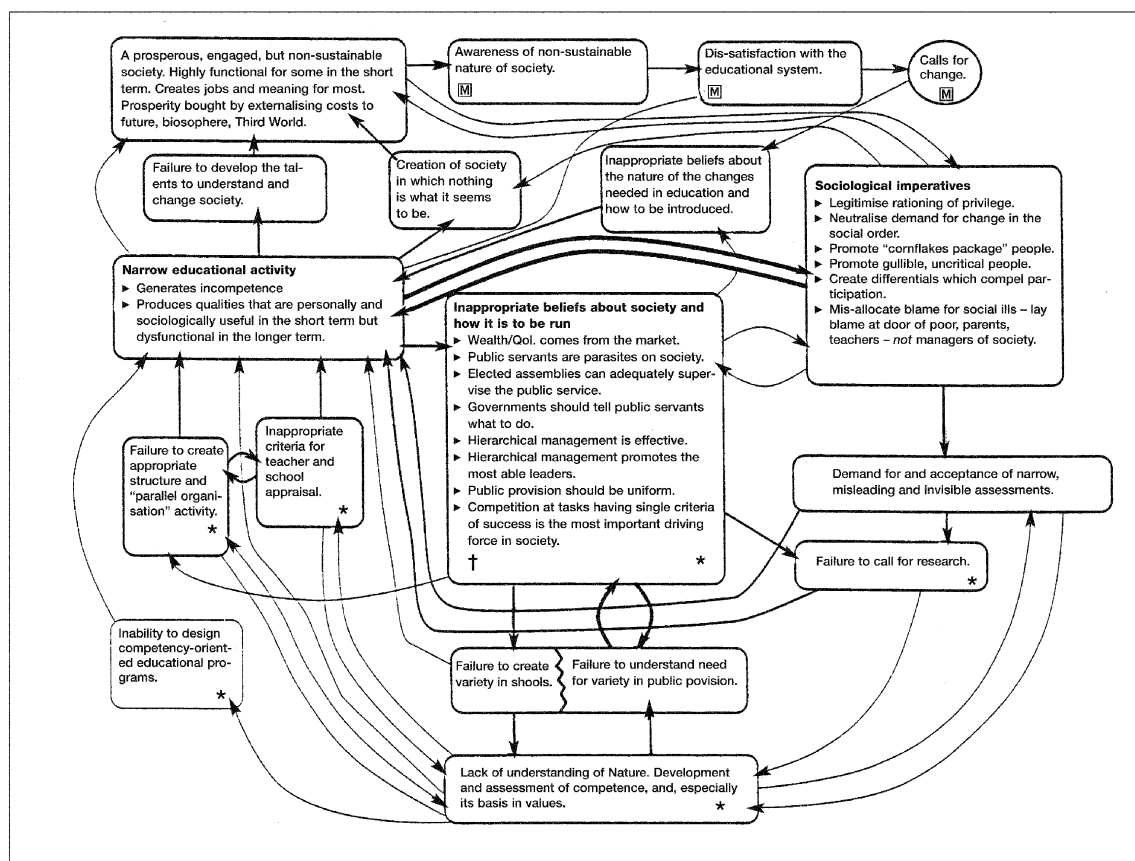
Fig. 4. In 1970, the rate of capital accumulation is increased 20 per cent in an effort to reverse the decline in quality of life. The pollution crisis occurs before natural resources are depleted. Again this produces an unprecedented drop in population.

And so on.

As an aside, attention may be drawn to the fact that these projections powerfully illustrate what may be termed *Forrester's Law*: Common-sense based single-factor intervention in complex systems always produces counter intuitive, and usually counterproductive, effects.

So what one might have hoped to find in a publication which purports to build on *Limits to Growth* would have been an extension of this modelling work to include an attempt to map the social forces which control the inputs to the physical-biological-economic system mapped above and consideration of the forms of government (cybernetic systems) required to make multiple, system-oriented, interventions within that system, monitor their effects, and make and monitor a further round of interventions.

To illustrate what I mean by this we can take a look at following systemogram of the network of social forces which deflect the educational system from its goals.



\*Intervention in these cells would help change the nature of the qualities nurtured and rewarded in the system. Motives which could be harnessed to do this are marked M.

†These need to be replaced by acceptance of the need to make managed economies work – to find way of giving effect to information concerning the public long-term interest, the need to explicitly create variety and information on the personal and social consequences of the options, and to find ways of holding public servants accountable for, and getting them to at in, the long-term public interest. This means systematic, broadly based, evaluation and participative democracy.

This systemogram and its implications have been fully discussed elsewhere (eg Raven, 1994 **FIND RUSSIAN PUBLICATION...**) and need not be gone into here except to say that it illustrates (i) the way in which a network of mutually supporting social forces drive down the quality of education in schools and the key role played by the governance (socio-cybernetic) system in managing that system and (ii) the way in which a sociological system manufacturing and perpetuating hierarchy and the manufacture of endless, hierarchically-organised, but senseless, work (which is nevertheless destroying the soils, seas, and atmosphere) is also deflecting the educational system from its goals.

Clearly, key developments include (i) inventing/evolving ways of generating a governance/cybernetic system (in this case for the educational system) which experiments, learns, and evolves without reliance on dysfunctional centralised command-and-control arrangements and (ii) finding ways of intervening in the processes which result in what Bookchin called “the inexorable onward march of hierarchy”.

But my point in introducing this material here is to illustrate what the authors of *Come On might* have done: One might have imagined that a group steeped in the systems thinking behind *Limits to Growth* would have extended such analyses into mapping the social forces (like those illustrated in the education diagram) which control the inputs to the system and to generating a design for a quite different, socio-cybernetically based, governance system to intervene in the network of biological-physical-processes that, as they currently operate, are heading us toward our extinction as a species.

And beyond saying that this is what the authors of this book *might* have done, it is to assert that this is perhaps the most important thing to which we should now turn our attention.

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