A comment on world population growth rate and World3 simulation*

In the present article the writer discuss a number of alternative model of world population growth.

Introduction

Over the past few decades there is increasing concern among almost all scholars in the world, and especially environment scientist, economist, and system dynamics scientists alike, with respect to the population growth rate, and its impact to various global problems. Part of that concern is brought into public awareness through publication of Limits to Growth by meadows et al., around 1970s, and also its sequel with title Beyond the Limits.

While the simulation employed by Meadows et al. is based on system dynamics model developed by Forrester, and subsequently experts call that model as World3, an aspect which is often not considered important is that it has limitations and there are already critics on the model used. In this article, emphasis is given on such critics and limitation of limits to growth, and how a different population growth rate projection will lead to different conclusions.

First, we would like to mention that population growth projection conventionally uses an equation based on exponential growth of malthus [1]:

$$N(t) = \frac{C}{(T-t)^k}, \tag{1}$$

Where: C~1.8 x 10^{11}, T~2025, k~1. It is interesting to note here that both in World3 dos program (the writer obtained their dos program from a colleague who received that program a number of years ago from H. Bossel, a system dynamicist) and also none such reference is made in Limits to Growth concerning that exponential model, apparently because most modeler believe that such a model is the most realistic. But as we will explore further we will find that such an exponential growth is an over-estimate of the actual growth rate of world population. And while World3 already include feedback-loops as characteristics of system dynamics approach, one should realize that its basic model remains equation (1). This can be verified in World3 model which offers default limit of graphical presentation, ranging from 0 to 1.8 x 10^{11} for population growth scale. That would imply that C parameter is used as the highest point of graphical presentation scale.

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As we will discuss in subsequent section, that log-linear pattern can represent better the actual growth pattern of world population. This in turn can yield better projection.

Critics to Limits to Growth

Before we summarize critics to limits to growth, we will quote here a number of summarized conclusion of limits to growth, as described as follows:

Quoted from Limits to Growth [2]:

"…model we have constructed is, like every model, imperfect, oversimplified, and unfinished.

In spite of the preliminary state of our work, we believe it is important to publish the model and our findings now. (...) We feel that the model described here is already sufficiently developed to be of some use to decision-makers. Furthermore, the basic behavior modes we have already observed in this model appear to be so fundamental and general that we do not expect our broad conclusions to be substantially altered by further revisions.

Our conclusions are :

1. If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity.

2. It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future. …"[2]

As to the critics to ltg (limits to growth), one can summarize as described as follows: [3]

> "The most common criticisms of the original World3 model were that it underestimated the power of technology and that it did not represent adequately the adaptive resilience of the free market. Impressive —and even sufficient— technological advance is conceivable, but only as a consequence of determined societal decisions and willingness to follow up."[3]

Conventional and non-conventional model of population growth rate.

Second, let us take a look first at apparently similar growth rate, called the Moore's law for chip clock speed. But as nowadays the number shows that clock speed is not everything,

then we focus on the number of transistor inside the semiconductor instead. The growth pattern of the number of transistor inside a semiconductor follows quite similar exponential growth rate. See figure 1 (table) and 2 (graphic plot).

year Y	trans.no T	speed of increase SOI
1971	2300	
1972	3500	1200
1974	6000	1250
1978	29000	5750
1982	134000	26250
1985	275000	47000
1989	1200000	231250
1993	3100000	475000
1997	7500000	1100000
1999	9500000	1000000
2000	42000000	32500000
2002	55000000	6500000
2004	291000000	1,18E+08
2007	582000000	97000000
2008	820000000	2,38E+08

Figure 1. No of transistor as function of year

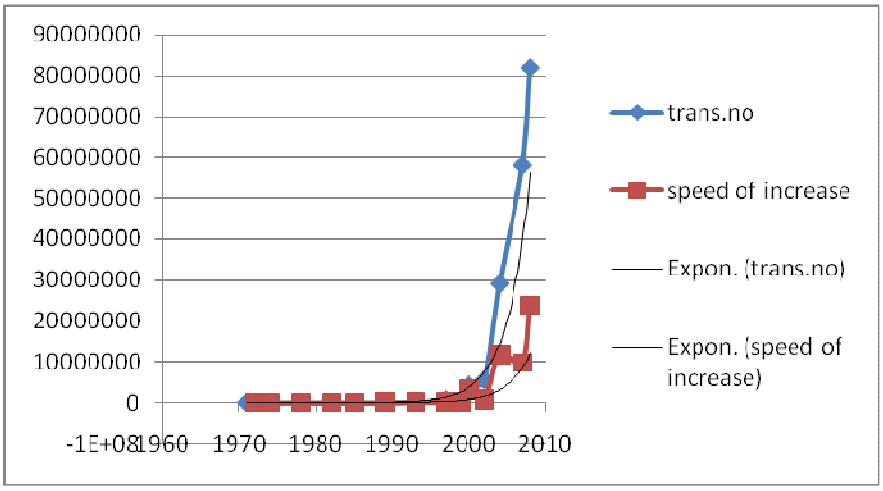

Figure 2. No of transistor grow exponentially.

But we can simplify further the graphical plot, by transforming the data to become log-log plot. The result will show quite exactly a loglinear growth pattern. See figure 3 (table, log log), and figure 4 (log log plot). Perhaps we can say that no. of transistor in a semiconductor follows a *loglinear-Moore's law* instead of standard Moore's law.

year	trans.no	speed of increase
logY	logT	log SOI
3,2947	3,36173	
3,2949	3,54407	3,0792
3,2953	3,77815	3,0969
3,2962	4,46240	3,7597
3,2971	5,12710	4,4191
3,2978	5,43933	4,6721
3,2986	6,07918	5,3641
3,2995	6,49136	5,6767
3,3004	6,87506	6,0414
3,3008	6,97772	6,0000
3,3010	7,62325	7,5119
3,3015	7,74036	6,8129
3,3019	8,46389	8,0719
3,3025	8,76492	7,9868
3,3028	8,91381	8,3766

Figure 3. table depicting log of year and log of transistor number in a semiconductor

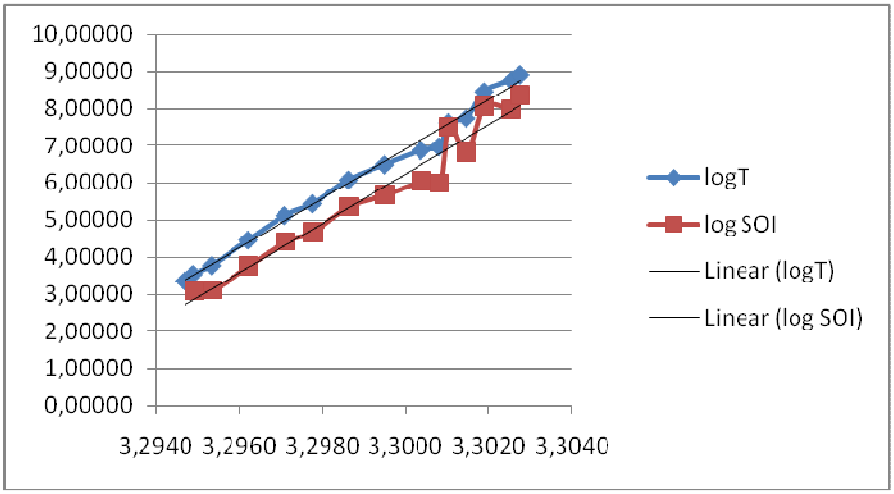

Figure 4. log-log plot of number of transistor in a semiconductor and log of year

Now we turn our attention again to equation (1).

The commonly used model (1) has significant drawback, that is that it implies that there will be very large increase in 2025, as (T-t) approaches zero, which seems to be unlikely, furthermore it yield projection of world population significantly exceed 2000 value, because the six-billionth human was born around 2000, and the model (1) over-estimate projection significantly.

Other improvement of this conventional model is discussed in ref. [4], based on refinement by Kapitza, which can be summarized as follows:

$$\frac{dN_E}{dt} = \frac{C}{(T-t)^2 + \tau^2} = \frac{C}{(T-t)^2 + 45^2}, \tag{2}$$

Where T is now revised to be 2026, instead of 2025 in [1]. A slight difference.

Another model that looks interesting is the sinusoidal equation as follows:

$$\frac{dN_E}{dt} = \frac{r}{\gamma}\sin^2\frac{\gamma N_E}{r}, \tag{3}$$

Where r and γ are adjustable parameters. After some numerical fitting, one finds the following value: 0.4 and 0.000005, respectively. As shown in ref. [4], the result can be interpreted as signal of phase transition, instead of dynamics crossover, as indicated in World3 simulation package.

Furthermore, one can expect similar loglinear pattern using equation (2) and equation (3), but not for equation (1). And again, equation (1) exceeds the observed world population number around 6x10^9 at 2000, that is why one can begin to question validity of using equation (1) to make reliable estimate of world population growth.

See figure 5 and 6, for graphical plot comparing eq. (1) , (2) and (3). While figure 7 and 8 depict the table and graphical plot for the same equations, but in log-log scale. It should be clear that loglinear growth pattern appear more precise to represent the world population growth. In the following figure (5) and (6), F1, F2, and F3 represent equation 1, 2, 3 respectively. To calculate projection based on equation 2 and 3, one should begin with an assumption on the value of No. In this model, we begin with year 2000, therefore N_0=N(2000), and then we adjust the value of No such that N(t) for N(2000)=6000, that is six billions population in 2000. Other population number are also in million scale.

$$N(t) = N_{i-1} + \frac{dN_i}{dt} = N_{i-1} + \frac{C}{(T-t_i)^2 + 45^2}, \tag{4}$$

$$N(t) = N_{i-1} + \frac{dN_i}{dt} = N_{i-1} + \frac{r}{\gamma}\sin^2\frac{\gamma N_i}{r}, \tag{5}$$

Thus we obtain that N(2000)=6000 for F2, and N(2000)=6000 for F3.

yr (from 2000)	F1 (in mio.)	F2 (in mio)	F3 (in mio)	actual
2000	6923,077	6000	6000	6000
2001	7200,000	6067,925	6148,682	
2002	7500,000	6137,129	6303,303	
2003	7826,087	6207,606	6464,108	
2004	8181,818	6279,348	6631,342	
2005	8571,429	6352,341	6805,251	
2006	9000,000	6426,568	6986,074	
2007	9473,684	6502,008	7174,045	
2008	10000,000	6578,636	7369,386	
2009	10588,235	6656,423	7572,302	
2010	11250,000	6735,336	7782,978	
2011	12000,000	6815,336	8001,574	
2012	12857,143	6896,381	8228,215	
2013	13846,154	6978,423	8462,986	
2014	15000,000	7061,410	8705,926	
2015	16363,636	7145,287	8957,019	
2016	18000,000	7229,993	9216,183	
2017	20000,000	7315,463	9483,269	
2018	22500,000	7401,629	9758,048	
2019	25714,286	7488,418	10040,208	
2020		7575,754	10329,347	
2021		7663,559	10624,971	
2022		7751,751	10926,493	
2023		7840,246	11233,234	
2024		7928,960	11544,430	

Figure 5. World population projection with three different equations

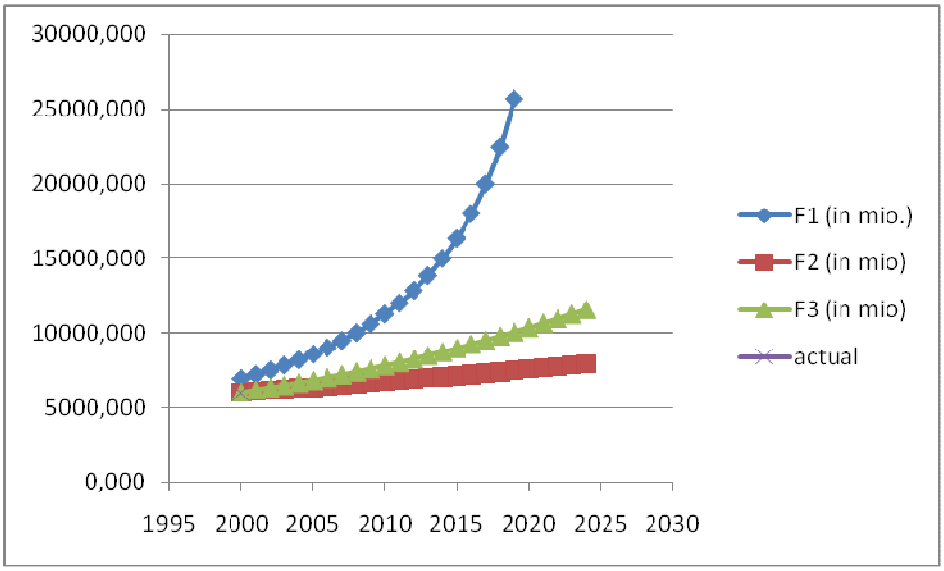

Figure 6. Graphical plot of world population projection with three different equations

log F1 versus log yr

log yr (>2000)	logF1 (mio.)	logF2 (mio)	logF3 (in)	actual
3,30103	3,840	3,7782	3,7782	3,778151
3,301247	3,857	3,7830	3,7888	
3,301464	3,875	3,7880	3,7996	
3,301681	3,894	3,7929	3,8105	
3,301898	3,913	3,7979	3,8216	
3,302114	3,933	3,8029	3,8328	
3,302331	3,954	3,8080	3,8442	
3,302547	3,977	3,8130	3,8558	
3,302764	4,000	3,8181	3,8674	
3,30298	4,025	3,8232	3,8792	
3,303196	4,051	3,8284	3,8911	
3,303412	4,079	3,8335	3,9032	
3,303628	4,109	3,8386	3,9153	
3,303844	4,141	3,8438	3,9275	
3,304059	4,176	3,8489	3,9398	
3,304275	4,214	3,8540	3,9522	
3,304491	4,255	3,8591	3,9646	
3,304706	4,301	3,8642	3,9770	
3,304921	4,352	3,8693	3,9894	
3,305136	4,410	3,8744	4,0017	
3,305351		3,8794	4,0141	
3,305566		3,8844	4,0263	
3,305781		3,8894	4,0385	

3,305996	3,8943	4,0505
3,306211	3,8992	4,0624

Figure 7. World population projection with three different equations (in log-log scale)

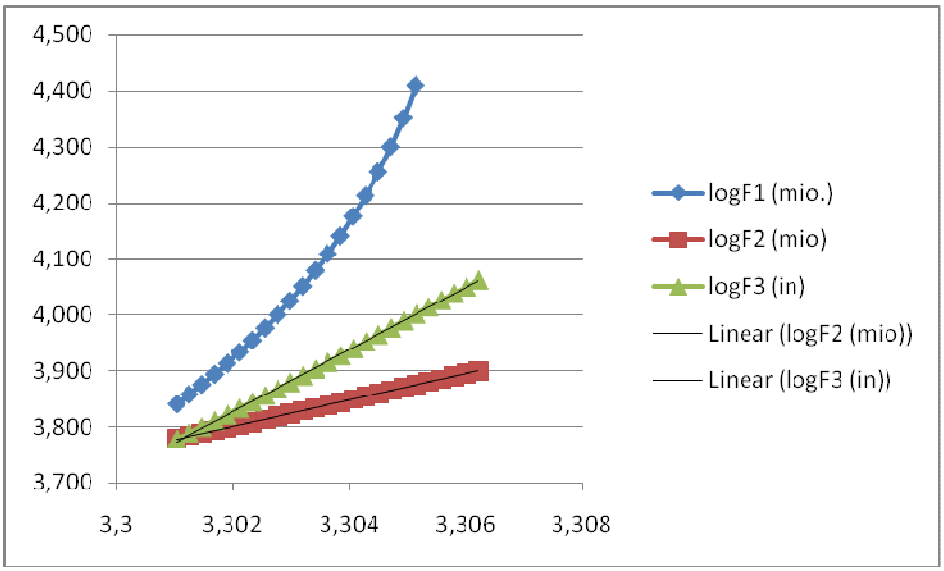

Figure 8. Graphical plot of world population projection with three different equations (in log log scale)

We can remark here that the above model can be extended to include feedback-loop for precision, but that can be developed further, because the purpose of the graphical plot above is to find out whether there are other plausible models for world population projection.

Why you ought not to use some vaccination for depopulation

Apparently as a result of the above overestimate of world population growth, there are a number of alarmist effect, including suggestion to do depopulation, which is another name of soft-termination of a number of people, both using negative-check measures, or using positive check measures (in malthusian language). We discuss here a recent issue, that is public speech made by bill gates last year concerning his program to do depopulation using vaccination program in a number of developing countries.[12] From the viewpoint of the

world population projection as discussed above, such a drastic measure based on exaggerated model appear too ridiculous.

A number of reputable scientist and not less than bill gates seem to think that reducing population (depopulation) significantly can solve unwanted global heating,[5] that is that reducing population can be a good solution of the problem of CO2 emission. His argument is that CO2 emitted by human being is the primary culprit of unwanted heating of the globe, therefore his argument is continued with reasoning that for reducing such an unwanted heating, then human CO2 emissions should be drastically reduced, and for doing so: then human population should be reduced systematically. His formula, as he explained in February 2010 in a public speech, can be simplified as follows: CO2 = P x S x E x C, where CO2, P, S, E, C each represent projected totally humanly-emitted carbondioxide, population number, average number of services per person, and the average amount of energy units per service, and the average CO2 emitted load per unit of service per year, respectively.

There are a number of video clips which you can easily found in youtube or elsewhere, which summarize mr Gates's presentation. For example, see the following urls: http://www.youtube.com/watch?v=CcBKLhWY9is

And what about his method? Now that seem not too surprising, given that he has been quite active to support vaccination via his charitable foundation. Of course, that would not mean that he want to do reduce present population with vaccination, what he aims to do is to reduce the growth rate of world population.

To summarize, such a drastic measure can be viewed as side effect of publication of ltg (limits to growth). The study is based on finite earth hypothesis, and its primary argument is more or less as follows: as energy and other resources continue to be more scarce in 21th century, then at a point there would be real problem imposed by human population, which need to be addressed drastically. Limits to growth give a hundred year projection based on their model called World3, then they conclude that such a simulation give projection that unless the world take drastic measure, then before one hundred year from 1970s, human beings will find great problems. Since then there are increasing movement towards addressing human population in drastic measure.

Some of the reader would argue then that supporting depopulation program is not the same with terminating present population, because the measure actually is vaccination or other measures intended to reduce population growth rate. But for you to know that among those elite groups, there are plan to take both drastic measures, i.e. reduce growth rate of population to zero growth (negative checks), and also to reduce present population drastically (positive checks, in malthus language).

While solving natural resources depletion remain an open problem, one perhaps can recall that no matter what happen, reducing 90% human population in the name of human-beings survival in this planet is not a legitimate policy. But that is exactly what some leading environmentalist aim to do[6]. And once again we can remark that World3 is based on population projection which is not realistic compared to present growth of world population. Hopefully government and policy makers all over the world can make up their mind concerning this issue, and stop doing depopulation, especially to foreign countries.

For other critics concerning the use of computer simulation, see [7] for instance.

What is world humanitarian forum and club of rome

For you to know: world humanitarian forum is part of club of rome activities. quote: "Mr. Walter Fust, Director General of the World Humanitarian Forum"[9].

The main theme of club of rome is quite clear, that is they demand that: "radical measures must be taken urgently to avert the risks of runaway climate change and ecosystems collapse."[9] What they mean with radical measures include excessive and massive depopulation policy including devastating a number of countries, which they think are beyond control, including but not limited to el salvador.

Quote: "According to an NSC spokesman, Kissinger initiated both groups after discussion with leaders of the Club of Rome during the 1974 population conferences in Bucharest and Rome. The Club of Rome, controlled by Europe's black nobility, is the primary promotion agency for the *genocidal reduction of world population levels*. The Ad Hoc Group was given "high priority" by the Carter administration, through the intervention of National Security Adviser Zbigniew Brzezinski and Secretaries of State Cyrus Vance and Edmund Muskie. "[8]

Their main character is typical of destructionists, that is those people who think that they can develop and build after they destruct a number of countries (that is to "develop through destruction"). quote: "the financial crisis and the consequent economic slowdown provide an exceptional opportunity to restructure economic and financial systems so as to achieve new patterns of environmentally sound."[9]

See also a pseudo-lecture in [10], how population is seen as major problem, and therefore massive depopulation is their opt choice to solve. That is the character of global depopulation policy promoted by the club of rome, world humanitarian forum, and global humanitarian forum. This project they call as "a new international humanitarian order," apparently as a new terminology of NWO (new world order).

The characters of the message by those global pseudo-leaders who are almost all of them industrial leaders, are not so different from the message from nobel for peace summit in nov. 2009, [11] with exception that in the nobel for peace laureates' message there is no specific mention of "depopulation policy" as solution of global problems. In the meantime, there is a number of depopulation policies which remain in place, see for instance NSSM 200 advocated by H. Kissinger in the 70s. [11]

Concluding remarks

We discuss shortly a number of alternative model of world population growth. Two alternative models considered here yields a new observed pattern that is log-linear growth pattern, and they appear quite insightful to suggest as better population projection compared to the standard exponential growth based on malthus. One can even begin to compare with other growth pattern, that is growth of no. transistor in a semiconductor, which also follows log-linear growth, that is why perhaps a better name for that pattern is log-linear Moore's law.

While the simulation employed by Meadows et al. is based on system dynamics model developed by Forrester in MIT, and subsequently experts call that model as World3, it is often not considered important that it has limitations and there are already critics on the model used. In this article, emphasis is given on such critics and limitation of limits to growth, and how a different population growth rate projection will lead to different conclusions.

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Mid of aug 2010, revised 1st: 29th aug. 2010, revised 2nd: 16th January 2011.

VC, url: http://www.sciprint.org

Endnotes:

[1] Karev, G.P. (2005), "dynamics of inhomogenous populations and global demographic models," p.2 in arXiv:physics/0505039

[2] source: url: http://www.propagandamatrix.com/archive_club_of_rome.html

[3] source: url: http://www.sublimeoblivion.com/2010/02/16/review-ltg/

[4] Golosovsky, M. (2009), "models of the world human population growth – critical analysis," p.2-4 in arXiv:physics.soc-ph/0910.3056

[5] quote: "The depopulation plan is supported by the world's wealthiest people, including Bill Gates, who admittedly funds vaccinations to reduce global populations by 10-15%. Leading population planners and economic developers advance identical plans to cull the world's population to 1 billion. … requires planning and an unprecedented conspiracy to commit genocide by applying advances in genetic biotechnologies exclusively available and affordable to drug companies controlled by the investment bankers," Dr. Horowitz adds." Source url: http://jennyhatch.com/2010/05/09/profitable-depopulation-plot-links-jp-morgan-chase-and-goldman-sachs-to-vaccination-contaminations-and-bigpharma-corruption/

[6] LaRouche, L. (2009), Executive Intelligence Report, April 2009, vol 36 no.15, url: http://www.larouchepub.com/eiw/public/2009/2009_10-19/2009_10-19/2009-15/pdf/48-54_3615.pdf

[7] Imhof, P., (2006), "computer simulation in the controversy over limits to growth," url: http://doku.b.tu-harburg.de/volltexte/2006/172/pdf/RR4.pdf

[8] anonymous, "world depopulation is top NSA agenda: club of rome," http://educate-yourself.org/nwo/nwopopcnsaglobal2000report10mar81.shtml

[9] http://www.clubofrome.org/eng/meetings/vienna_2009/

[10] club of rome: inching towards peace, http://www.clubofrome.at/news/sup2009/dl_dec_hrh.pdf. Also quote: "The Club of Rome is a Neo-Malthusian organization with interlocking membership with European power elite groups such as the Committee of 300 (a secret society…) and the Bilderberg Group. Malthus argued that population was held within resource limits by two types of checks: positive ones, which raised the death rate, and preventative ones, which lowered the birth rate." url: http://www.jeremiahproject.com/newworldorder/club-of-rome.html

[11] quote: "Franz Josef Radermacher from the Club of Rome and Global Marshall Plan initiative, Ian Dunlop from the Club of Rome," URL: http://www.nobelforpeace-summits.org/final-conference-statement-10th-world-summit-2/. NSSM 200 is an active policy until present time, http://www.population-security.org/28-APP2.html, http://www.lifesitenews.com/waronfamily/nssm200/index.html

[12] gates exposed and admit vaccine have been used for depopulation:

http://www.youtube.com/watch?v=CcBKLhWY9is&feature=related. See also:

bilderberg depopulation policy:
http://www.youtube.com/watch?v=jlcGtbDzy1w&feature=related

url:

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http://www.esnips.com/web/Guidetorepent
http://www.esnips.com/web/RepentanceGuide
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