

'We tend to "tunnel" while looking into the future, making it business as usual, Black

Swan-free, when in fact there is nothing usual about the future'

(Nassim Nicholas Taleb, *The Black Swan*, the impact of the highly improbable)

'One of the reasons I think history is endlessly interesting is that nothing ever had to happen the way it happened. It was never on a track, never preordained'.

(David Mc Cullough)

'Ne t'en fais pas pour ceux-lá, ils rêvent'.

(Antoine)

'Das Geschäft mit der Angst dürfte das in Wahrheit älteste Gewerbe der Welt sein'.

(Thea Dorn, *Lust an der Apokalypse*)

FALLACIES OF GLOBAL REASONING: MORE INCONVENIENT TRUTHS

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A fallacy is 'a plausible reasoning that fails to satisfy the condition of valid argument or correct inference' (Webster's). I am mainly interested in fallacies of global reasoning in today's environmental debate, ever started in 1972 by the old Club of Rome's 'Limits to growth'. Among today's most prominent examples of global reasoning are the Kyoto protocol (including the emissions trading), WWF's Living Planet Report, the Millenium Ecosystem Assessment and the IPCC.

My thesis is that fallacies of global reasoning such as fallacies of disaggregation, average or of misplaced concreteness produce even more 'inconvenient truths'.

A multi-level analysis is called for on macro, meso and micro levels, but – in especial – on the meso level of cities and regions. It is important to be prepared for

all relevant eventualities beware negative 'Black Swans', but also looking for positive ones born from serendipity. The tricks we can manage, however modest, may save us from another fallacy, the appeal for fear.

1. Levels of analysis & levels of conclusion

A fallacy, generally speaking, is 'a plausible reasoning that fails to satisfy the condition of valid argument or correct inference' (Webster's). I first learned about fallacies as a methodological concept in sociology (Hannan, 1971) in particular about fallacies of aggregation and disaggregation. They refer to translating 'back and forth between the macro level, where groups are the unit of analysis, and the micro level where the focus is on individuals' (Blalock, 1967: 21). I have retained that the level of conclusion should correspond to the level of analysis. It is not correct to jump from a higher level of analysis to a lower level of conclusion (fallacy of disaggregation) or vice versa from a micro level of analysis to a macro level of conclusion (that is, without a multi-level analysis [1]). Take for example prejudice. Having found an aggregate relation between crime rates and a certain ethnic origin, some people may be tempted to conclude that an individual member of the same origin is a criminal. Or, meeting one member of this group, one may conclude that the entire group is criminal.

Sociology deals primarily with groups and individuals as unit of analysis. But, being interested in fallacies of global reasoning, it is useful to distinguish different spatial as well as temporal scales, ranging from the world down to the micro level, say, of neighborhoods via the meso level of regions and cities. Likewise, temporal units of analysis range from the long term down to the short term.

If one studies problems at different spatial and/or temporal levels, 'conclusion' not only reads 'explanation' or 'prediction', but also 'problem solution' referring to levels of policy intervention.

Moreover, fallacies of aggregation or disaggregation are not the only erroneous reasonings. Browsing the Internet via Google, one finds a whole list of fallacies some of which, too, may be relevant to our case [2].

2. The old Club of Rome

This is not a treatise on methodology. It is rather about applying the methodological rules to global reasoning. The interest is not (purely) scientific. It is intrinsically political. What better way of starting than looking back at the Club of Rome's 'Limits to growth' (Meadows, 1972).

This MIT study deals with the mutual dependence and interaction of five critical factors: population growth, food production, industrialization, depletion of natural resources, and pollution (at world level, till 2100). The analysis is based on Forrester's 'System Dynamics model', a model typical for the 'golden age' of complex modeling. It has been a controversial approach (Lee, 1973) which has not survived the seventies. Relying on the global version of the System Dynamics model, the Club of Rome has put all of its eggs in one methodological basket.

'Limits to growth' has a Malthusian ring to it as it includes limits to population growth. To some, 'limits to growth' reads 'limits to economic growth'. A balanced and sustainable development is more complex. According to the European Union, sustainability is about three fundamental goals:

- *economic and social cohesion;*
- *conservation of natural resources and cultural heritage; and*
- *more balanced competitiveness of the European territory.*

(European Commission, 1999:10)

In shorthand, sustainability is a matter of 'three P's', that is People, Planet and Profit (or Prosperity).

'Limits to growth' glosses over social factors or social cohesion for that matter. But even back in 1970 this has been an issue. I recall a goals survey held in Los Angeles. The richer European Americans gave priority to the fight against pollution whereas African Americans, for example, put employment before environment. Today similar differences may exist between industrialized and developing countries.

The Club of Rome sticks to the world level without delving into national or local levels(the latter rather seems to be associated with a short-term perspective). As long as the global level of analysis corresponds to a global level of conclusion or policy intervention, no fallacy is 'committed'. But if rich nations 'consume' more planets than poor nations do [3], a fallacy of disaggregation looms. One may also call this a *fallacy of average*. The same holds for regions and cities. The 'limits to growth' may sooner be reached or even overstepped in some nations, regions or cities [4]. Neither the world nor the nation states are homogeneous when it comes to sustainability or the lack of it.

The old Club of Rome dreamed of a world forum beyond formal intergovernmental negotiations trying to reach a state of worldwide balance. More than thirty years later this dream still has not come true. But after 1972, others have taken over the concern put on the agenda by the Club of Rome. Take the Kyoto protocol, emission

rights, humanity's ecological footprint, the living planet index, ecosystem assessment and the like. More about this in the section that follows. However, since the inconvenient truth of climate change is disseminated (it has certainly helped to 'recycle' Al Gore), The Club of Rome is 'back in business' in Winterthur (not too far from the melting glaciers): <http://www.clubofrome>.

The question is whether its 'new path for world development' will fall into the old pitfalls. For the time being, one can only say that the professed intent of the program contains all the right sound bites.

3. Fallacies of global reasoning – selected examples

I have selected a few examples of global reasoning to illustrate the argument, starting with the **Kyoto protocol** (<http://unfccc.int>).

To fight global warming, the industrialized countries have committed themselves to reduce CO₂ emission worldwide by 5% between 1990 and 2012. In addition, individual targets have been set per country.

The percentages, first of all, point to what I call *fallacies of misplaced concreteness* [5]. Has the 5% norm been derived from an equation quantifying a causal relationship between tons of CO₂ emission and degrees centigrade of global warming? This, ideally, specified by source – on order of decreasing importance – energy plants, industry & construction, transport, consumers, agriculture, waste and others. But the relationship can hardly be expected to be a linear one. Working with CO₂ norms also implies fallacies of average (disaggregation) as neither 'the world' nor individual nations are homogeneous. There is also the simple fact that not all of the 190 countries, industrialized or not, have signed the protocol. Take only the US or China, India and Brazil. Moreover, what is the use of fixing targets for large heterogeneous countries such as the US, Canada, Brazil, Russia and so forth? How many regions with an average carbon dioxide emission are there? And isn't it more important to identify extreme CO₂ emission in potential disaster areas? These questions even pertain to small countries such as the Netherlands or Belgium. Finally, national scores are aggregated at world or Kyoto level which is, given the heterogeneity of nation states, a fallacy of aggregation.

Fixing norms, however, makes it easier to measure failure. The CO₂ emission in countries that have signed the Kyoto protocol has increased by 2.3% between 2000 and 2006, but the target has almost been reached between 1990 and 2006 – thanks to Russia facing a major industrial crisis. The developed countries as a whole (including Russia), regardless of Kyoto, have even shown a growth rate of

9.9% between the years 1990 and 2006, not counting the emergent economies of China, India and Brazil.

Taking the example of Russia, cynics might argue that an economic crisis is the best way to fight carbon dioxide emission and, hopefully, global warming (by the way, stop breathing also reduces carbon dioxide emission). The economic crisis, on the other hand, may tend to shift of priorities from environmental to economic issues.

In Poznan, new targets have been launched with the EU taking the lead. One should not become fixated on norms as 'magic numbers' entail a fallacy of misplaced concreteness. More important is whether one is heading in the right direction of *less* emission, *more* sustainable energy (sun, water, wind, bio) and of *more* energy saving – especially if there is no clear-cut linear causal relation between CO₂ emission and global warming.

To meet the Kyoto targets, a market-based mechanism has been introduced: **emissions trading** (the so-called carbon market) and its two correlates, the clean development mechanism and joint implementation.

A country can trade actual emission units. First of all, excess capacity in one country can be sold to a country that cannot meet its target. Other opportunities of trading are:

- removal units on the basis of land use, land-use change and forestry (for example reforestation),
- emission reduction by a joint implementation project earning emission reduction units from emission-reduction or emission removal projects in other protocol countries (so-called Annex B Parties),
- certified emission reduction generated from a clean development mechanism (CDM) project in developing countries.

(Recently, carbon dioxide capture and storage also qualifies as CDM projects.)

What has been said about the Kyoto protocol, of course, also holds for the emissions rights. The same fallacies hold here, too. The most flagrant fallacy of aggregation, however, is committed in the case of CDM projects adding up the performances of highly heterogeneous units as developing and industrialized countries. What use is, for example, rural electrification (using solar panels or the installation of more energy-efficient boilers in a developing country when the real, urgent problem is how to alleviate pollution in industrialized countries, in particular in extremely vulnerable, potential disaster areas? The clean development mechanism is meant to give industrial countries 'some flexibility' – by giving them the right to pollute some more ...

Another contribution to the current environmental debate has been made by the **WWF** (<http://www.panda.org>).

The Living Planet Report is built upon two indicators: humanity's ecological footprint and the living planet index. The first measures 'the area of biologically productive land and water needed to provide ecological resources and services – food, fibre and timber, land on which to build, and land to absorb carbon dioxide (CO₂) released by burning fossil fuels'. The living planet index, on the other hand, measures biodiversity. It tracks populations of 1313 vertebrate species: terrestrial, marine and freshwater ones.

Both indicators show alarming trends. Since the late 1980s, the ecological footprint exceeds the biocapacity of the earth by 25%; whereas the earth's biological diversity has decreased by 30% since 1970. If present trends continue, doom looms by the year 2050.

The hidden but untenable assumption of the world and of nations being homogeneous systems leads to fallacies of average and disaggregation. The WWF, however, clearly demonstrates that some countries are more effective in drawing down the natural capital. The leading countries are the US and the United Emirates – as far as the ecological footprint is concerned. WWF does not deal with regions and cities, but this can be mended by calculating ecological footprints for these lower scales. Biological diversity is a slightly different matter. Although it is technically possible to measure it at local and regional levels, terrestrial, marine and freshwater realms more often than not cross borders, even national ones and even those of larger countries.

Our last example of global reasoning differs from the foregoing ones in a positive sense (at least to some extent). The **Millennium Ecosystem Assessment** (MA in short) – first of all – acknowledges the existence of uncertainties by building scenarios for the years 2000-15, 2015-30, 2030-50 and 2050-2100 (the latter is called a challenge). See Carpenter, Pingali, Bennett & Zurek, 2005 for details.

Major uncertainties exist with regard to, on one hand, governance and economic development (regionalized versus globalized) and, on the other hand, ecosystem services management (reactive versus proactive). Combining 2x2 possibilities one arrives at four global scenarios:

- *Order from Strength*: globalized, with emphasis on economic growth and public goods, i.e. global economic and social policies
- *Global Orchestration*: regionalized, with emphasis on national security and economic growth; protection through boundaries of paramount importance

- *Adapting Mosaic*: regionalized, emphasizing local adaptation and flexible government; benefits and risk of regional management
- *TechnoGarden*: globalized, with emphasis on green technology, improving the provision of ecosystem services.

Global refers to 'all of Earth'. The regional scale does not go below global regions or countries (plus the aggregates of industrial and developing countries).

The MA scenarios embrace a broader notion of sustainability as they deal with the impact of ecosystem services on human well-being: material well-being, health, social relations, freedom of choice and action, security.

A scenario, according to the MA, is a '*plausible* [emphasis mine] and often simplified description of how the future may develop, based on a coherent and internally consistent set of assumptions about key driving forces (e.g. rate of technology change, prices) and relationships. Scenarios are neither predictions nor projections [6] and sometimes may be based on a "narrative storyline". Scenarios may include projections but are often based on additional information from other sources.

How far goes 'plausibility' in avoiding what I call the *fallacy of ignoring uncertainty* ? Plausibly, there may be something completely wrong with plausibility. The crucial point here is *non-linearity*, i.e. 'a sudden (abrupt) discontinuity or change in rate which often forms the basis of thresholds. This may lead to unexpected outcomes or "surprises" '. From small effects that can lead to severe consequences (Taleb) to chaos theory.

The MA scenario builders have tried to identify major surprises under different scenarios in terms of likelihood of extreme events. As figure 1 shows, *Order from Strength* implies the greatest risk. Does this mean that, apart from *Global Orchestration*, the two regionalized scenarios are describing preferable futures?

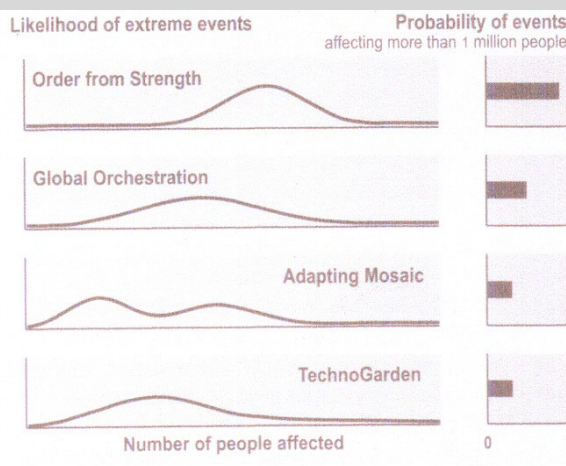


Figure1: Probabilities of extreme events that involve ecosystem services in MA scenarios

Left column: Magnitude of extreme event (measured as the number of people affected) on the x-axis versus likelihood of events of a given magnitude, on the y-axis. Right column: Length of the bar indicates probability of events that affect more than 1 million people.

(Source: Carpenter, Pingali, Bennett & Zurek (2005): 6)

Surprises testify to 'the impact of the highly improbable' or to what Taleb (2008) has coined 'Black Swans'. Another word for fallacy of ignoring uncertainty is 'Black Swan blindness', illustrated by figure 2. There are negative and positive Black Swans.

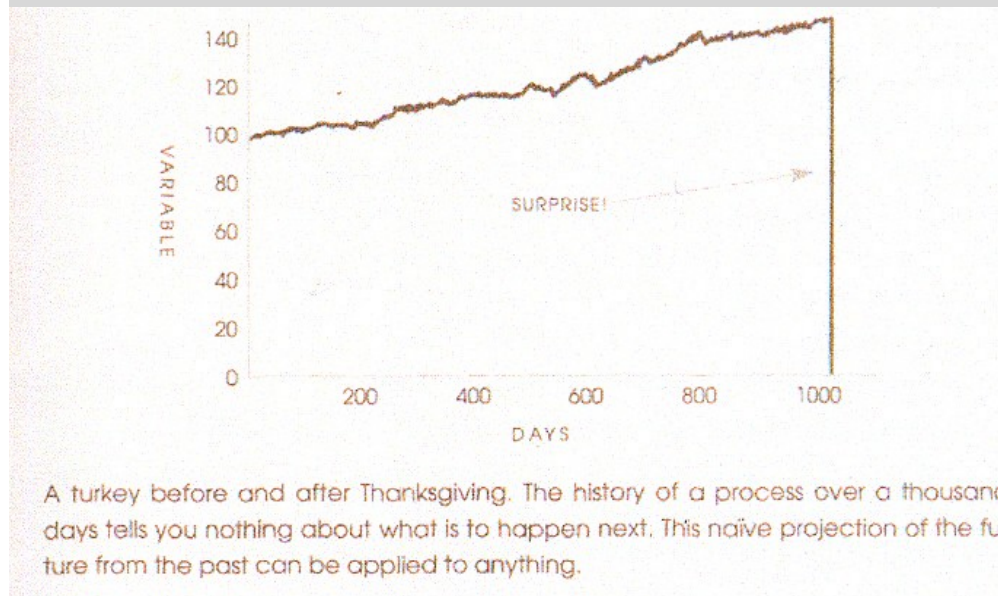


Figure 2: One thousand and one days of history

(Source: Taleb (2008): 41)

Environmental disasters such as tsunamis, massive flooding, earthquakes and the like affect most clearly the local scale. The risk involved can be clouded by fallacies of average as we came across in the reasoning of 'Limits to growth, Kyoto (including the emissions trading) or the WWF. Properly monitored at the scale of cities and regions, one can get a better picture of vulnerability, 'the exposure to contingencies and stress, and the difficulty in coping with them' (MA) plus the necessity of making eventuality plans. So far for negative Black Swans.

But there are also positive Black Swans or fat tails, in particular technological innovations that may help to prevent disasters affecting ecosystem services (the

ecological engineering capacity and knowledge). One may get the impression from our selected examples of global reasoning that they tend to play down technological change (including the rise of sustainable energies) for fear of sounding less alarming about the future. The MA is an exception to this as shown by the *TechnoGarden* scenario. That technological innovations often come as surprises, is corroborated by research on *serendipity* (Hannan, 2006 ; see also Taleb, 2008: 166-169) [7]. By the way, three of the most important new technologies of today—that is the computer, the Internet and the laser— are the product of inadvertent discoveries...

A word about IPCC, the Intergovernmental Panel on Climate Change: <http://www.ipcc.ch>. There are several reasons for this. The IPCC is dominating the environmental debate. IPCC fuels 'Kyoto' and others with information. It works with scenarios and it provokes controversy. I want to focus on the scenarios, being interested in how uncertainty is handled by IPCC. The Panel in its Fourth Assessment Report has presented two types of scenarios: those describing worlds that make no attempt at preventing global warming and those describing worlds concerned about the environment in 2100. How certain or rather how uncertain are these futures? Major uncertainties are of a qualitative nature. The degree of uncertainty depends on two variables (as shown in table 1):

- the level of agreement or consensus and
- the amount of evidence (theory, observation, models)

Level of agreement or consensus ↑	<i>High agreement limited evidence</i>	...	<i>High agreement much evidence</i>

	<i>Low agreement limited evidence</i>	...	<i>Low agreement much evidence</i>
	Amount of evidence (theory, observations, models) →		

Table 1: Qualitatively defined levels of uncertainty

[Note that there is also a mid-range category]

(Source: Guidance notes for lead authors of the IPCC Fourth Assessment Report on addressing uncertainties, July 2005, page 3)

Uncertainties in the Fourth Report are thus addressed in a hallmark fashion, evaluating scenarios as finished products. Whereas my personal experience with scenario building in France is that uncertainties are rather the cornerstone of scenario construction. Combinations of uncertainties are the constituting elements of scenarios. See Crozet & Musso (2003) and especially Crozet (2003) for details. Be that as it may, consensus and amount of evidence can be misleading if dissident expert opinions are discarded from 'evidence'. The critics name solar science, geology, hydrology, oceanology and biology, leave alone political science, sociology and historical science: all those disciplines that can help to understand man-made (anthropogenic) climate change. The work of IPCC is polarizing. It divides 'front office talk', focusing on extended peer review, and 'back office talk' of the 'under-critical model' (Hoppe & Huijs, 2003). It seems urgent to subject IPCC's handling of uncertainties to closer scrutiny [8] checking for fallacies of ignoring uncertainty (or any other fallacies for that matter). Already after a first evaluation two of Taleb's warnings come to mind. First, in choosing the year 2100 as time horizon of the scenarios IPCC runs a serious risk of 'forecast degradation'. Forecasts degrade as the projected period lengthens. Second, as models counts as evidence, one has to take into account that non-linear processes have greater degrees of freedom than linear ones. Hence one runs a great risk of using the wrong model.

4. A plea for a multi-level analysis of environmental issues – by way of conclusion

I have started with sociology distinguishing groups and individuals as units of analysis or macro from micro analysis. Groups can be studied at varying levels of aggregation including entire societies and the in-between meso level of cities and regions.

Similarly, economists use macro, meso and micro levels of analysis and fallacies of aggregation and disaggregation work in a similar way. The parameters of macroeconomic models may be mistaken for explanations of the behavior of individual firms or consumers or the later as representative of macroeconomic phenomena. And meso-level analyses of regions or cities can reveal fallacies of average, ignoring the fact that there are always winners and losers. One could even say that the aggregate that we call national economy is, at least to some extent, a construct whereas the 'real' economy is happening in cities and regions. More promising is the concept of network economy as opposed to the mythical entity of 'the market' (Barabási, 2002). A crucial question at meso level is: 'How do latecomers make it in a world in which only the rich get richer ?'

As to environmental issues, they are clearly dominated by the macro or global level. But there are also meso and micro levels to be considered in order to avoid fallacies of global reasoning. Micro refers to the level at which (sometimes surprising) technological innovations are produced. It has been my point throughout this essay that the meso level analysis of environmental issues – preferably from the angle of three-dimensional sustainability – is a must. We cannot afford fallacies of disaggregation or average but must rather monitor developments especially in critical regions and cities. Take only the polar regions. And it is by no means certain that rising sea levels will affect only developing countries such as Egypt, Bangladesh or Vietnam. London, New York, Hamburg or the Randstad Holland may also be danger zones. Meso-level analysis is not only important for the proper definition of problems, but also for effective ways of dealing with these problems, not discarding technological innovations or positive Black Swans (a typical meso tool for ‘maximizing serendipity’ is the so-called innovative milieu [9]).

Overemphasizing the global scale and the fallacies this entails, means to underestimate both environmental vulnerability and ways of coping with it. Regional or urban monitoring, too, is a way of bringing some long-term issues closer to home. One organization, say the UN or the EU can hardly cover all cities and regions in depth, but it can assist them in tackling their problems efficiently. This is where the good old principle of subsidiarity comes in: ‘the notion of devolving decision making authority to the lowest appropriate [-competent-] level’ (according to the Millenium Ecosystem Assessment). Note that recently the association of United Cities and Local Government has put ‘global’ environmental issues on its agenda, in line with my conclusion. See: <http://www.cities-local governments.org>.

Overemphasizing global reasoning also tends to nourish somehow the illusion that global government is the royal path to our coping with environmental dangers. Remember that the old Club of Rome has already been dreaming about a global, non-governmental governance some 35 years ago.

Finally, fallacies of global reasoning tend to create another fallacy, *the appeal to fear*: gaining compliance through threat. One may doubt whether installing fear is the right strategy. I, for my part, rather opt for maximizing serendipity which is also about the power of positive thinking, I opt for the

stance ascribed to Stonewall Jackson: *'We must not take counsel of our fears'*.

Postscript

Since I wrote the first version of this essay, two amazing reports have been published. The first, a study sponsored by the U.S. government, 'established' that global warming tied to carbon dioxide emission *'is largely irreversible for 1,000 years after emissions stop'* (Solomon, 2009). Note that the horizon of global reasoning has shifted to a millennium (will the next step lead us to evolutionary timescales?). What about 'forecast degradation'? The study does not consider geo-engineering to remove carbon dioxide from the atmosphere which according to the World Watch Institute is the hot item for the future (<http://www.worldwatch.or/stateoftheworld>). All of a sudden the 'State of the World, appears less alarming given the prospect of 'clean technology', *the* growth sector of the world economy. In the light of this new look on environmental issues, even more people will feel 'globally' manipulated, i.e. all those who are usually labeled 'climate skeptics' or 'those denying the greenhouse effect'. For more uncomfortable truths see Solomon's book on 'The deniers, the world-renowned scientists who stood up against global warming hysteria, political persecution, and fraud*'[10] (Solomon, 2008). I am not an expert in any of the scientific disciplines that deal with global warming. But my scientific training warns me against one-factor theories and simple correlations, against neglecting the limits of predictability by ignoring uncertainties, and against giving up the principle of falsifiability and falsification. Global warming rather seems to be a case for multiple working hypotheses already advocated by Chamberlin in (Chamberlin, 1965): *with this method the dangers of parental affection for a favorite theory can be circumvented.*

Notes

[1] Jumping levels would only work without any problems if relations at all levels were linear (if emerging properties would not exist) and if individuals in the sample were homogeneous (dispersion matters). Linearity and homogeneity, however, are the exception, not the rule.

[2] Go to <http://changingminds.org>

[3] This can be measured by the ecological footprint. More about his later.

[4] 'Terrorism kills, but the biggest killer remains the environment, responsible for close to 13 million deaths annually' (Taleb, 2008: 80).

[5] Whitehead defined this fallacy as the mistake of confusing a model with the physical entity that it means to describe. To me it refers to the popular tendency of decision makers to fix 'exact' but rather meaningless targets or 'magic numbers', pertaining to large aggregates. Another example is the 3% target fixed for R&D expenditures as a percentage of GDP in the European Union as a whole.

[6] A projection is a 'potential future evolution of a quantity or set of quantities, often computed with the aid of a model'. Projections 'involve assumptions concerning, for example, future socio-economic and technological developments that may or may not be realized; they are therefore subject to substantial uncertainty' (I have borrowed the definition from the MA glossary).

[7] A serendipist – according to Webster's – is 'one who finds valuable or agreeable things not sought for'.

[8] See in particular Moss & Schneider (2000) and Manning et al (2004).

[9] See Camagni & Maillat (2006) and, for innovation in general, Drewe (2006). A shorthand notion of innovative milieu is the 'triple helix'. More important than linguistic subtleties is whether a milieu really maximizes serendipity. Among the obstacles to serendipity may be listed bureaucratic tinkering from universities (through output measurements, rankings, citation indices – 'I quote you, you quote me' – and the like) or an overemphasis on spatial proximity by local authorities at the expense of virtual proximity as well as on formal instead of informal networks. The essential question is whether the milieu is an environment that allows for experimentation and trial and error and that tolerates failure.

[10] '* And those who are too fearful to do so'.

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