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FUTURE NEWS

TO CONNECT, TO INFORM AND TO INSPIRE

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Global Challenges

12 Risks that threaten human civilisation

An extract from a report by the Global Challenges Foundation. It is reproduced with their permission.

The full text is available upon request from the futures foundation office – email: info@futuresfoundation.org.au

This report has, to the best of the authors' knowledge, created the first list of global risks with impacts that for all practical purposes can be called infinite. It is also the first structured overview of key events related to such challenges and has tried to provide initial rough quantifications for the probabilities of these impacts.

The report conducts its exploration within carefully defined bounds, resulting in a list of twelve risks with a possible infinite outcome. There were many challenges which might have been included on the list because of their ability to pose severe damage to humanity. They were excluded for one or more of three reasons:

1. Limited impact – tsunamis, for example, and chemical pollution.

2. No effective countermeasures – the report focuses on promoting effective interventions and so ignores challenges where nothing useful can be done to prevent or mitigate the impact, as with nearby gamma-ray bursts.

3. Included in other challenges. Many challenges are already covered by others, or are very similar to them. Population growth, for one, is significant for climate change and ecosystem catastrophe, but without direct large-scale impacts of its own.

It is worth noting that complex systems are often stable only within certain boundaries outside which the system can collapse and rapidly change to a new stable state. Such a collapse can trigger a process where change continues for a long time until a new stable state is found. None of the risks in this report is likely to result directly in an infinite impact, and some cannot do so physically. All the risks however are big enough to reach a threshold where the social and ecological systems become so unstable that an infinite impact could ensue.

This is a report about two extremes, not one. It is about how a better understanding of the magnitude of the challenges can help the world to address the risks it faces, and can help to create a path towards more sustainable development. It is a scientific assessment about the possibility of oblivion, certainly, but even more it is a call for action based on the assumption that humanity is able to rise to challenges and turn them into opportunities. We are confronted with possibly the greatest challenge ever and our response need to match this thorough global collaboration in new and innovative ways.

The Goals of the Report

The first of the report's goals – acknowledging the existence of risks with potential infinite impact – seeks to help key stakeholders to acknowledge the existence of the category of risks that could result in infinite impact and to show them that we can reduce or even eliminate most of them.

The second inspires by showing the practical action that is taking place today. This report seeks to show that helping to meet these global challenges is perhaps the most important contribution anyone can make today, and highlights concrete examples to inspire a new generation of leaders.

The third goal is to connect different groups at every level, so that leaders in different sectors connect with each other to encourage collaboration. This will need a specific focus on financial and security policy where significant risks combine to demand action beyond the incremental.

The fourth goal is to deliver actual strategies and initiatives that produce actual results. The report is a first step and its success will ultimately be measured only on how it contributes to concrete results.

The report will have achieved its goals when key decision-makers recognise the magnitude of the possible risks and our ability to reduce or even eliminate most of them.

A New Category of Global Risk

The idea that there may be risks where the impact can be described as infinite, defined as the end of human civilisation or even human life, is not new. However, it excites relatively little political or academic interest and the way it is treated in popular culture makes a serious discussion harder.

For several reasons the potentially infinite impacts of the challenges in this report are not as well known as they should be. One reason is the way that extreme impacts are often masked by most of the theories and models used by governments and business today.

Climate change is a good example, where almost all of the focus is on the most likely scenarios and there are few public studies that include the low-probability high-impact scenarios. In most reports about climate impacts, those caused by warming beyond five or six degrees Celsius are omitted from tables and graphs. Other aspects that contribute to this relative invisibility include the fact that extreme impacts are difficult to translate into monetary terms, they have a global scope, and they often require a time horizon of a century or more. They cannot be understood simply by linear extrapolation of current trends, and they lack historical precedents. There is also the fact that the measures required to significantly reduce the probability of infinite impacts will be radical compared to a business-as-usual scenario.

A scientific approach requires us to base our decisions on the whole probability distribution.

The review of literature indicate that, under a business as usual scenario, new risks with potential infinite impact is probably inseparable from the rapid technological development in areas like synthetic biology, nanotechnology and AI.

Most risks are linked to increased knowledge, economic and technical development that has brought many benefits. E.g. climate change is a result from the industrial revolution and fossil fuel based development. The increased potential for global pandemics is one consequence of an integrated global economy where goods and services move quickly internationally. Similar challenges can be expected for synthetic biology, nanotechnology and AI.

There are remedies, including technological and institutional, for all risks. But they will require collaboration of a sort humanity has not achieved before, and the creation of systems which can deal with problems pre-emptively. It is important to understand that much of the knowledge and many tools that we have, and will develop, can be both a risk and a solution to risks depending on context.

Infinite Impacts and Thresholds

There is a clear ethical dimension to the concept of infinite impact, because a very small group alive today can take decisions that will fundamentally affect all future generations.

Its equally clear economic component can generate disagreement over issues such as discounting, which the report examines in some detail, considering for example the role of tipping points.

The report distinguishes between the concepts of infinite impact – where civilisation collapses to a state of great suffering and do not recover, or a situation where all human life end – and infinite impact threshold – an impact that can trigger a chain of

events that could result first in a civilisation collapse, and then later result in an infinite impact. Such thresholds are especially important to recognise in a complex and interconnected society where resilience is decreeing.

A collapse of civilisation is defined as a drastic decrease in human population size and political/ economic/social complexity, globally for an extended time.

Risk = Probability x Impact

The following six pages contain a quick overview of each risk.

Current risk

5 key factors:

1. The uncertainties in climate sensitivity models, including the tail.
2. The likelihood - or not - of global coordination on controlling emissions.
3. The future uptake of low carbon economies, including energy, mobility and food systems.
4. Whether technological innovations will improve or worsen the situation, and by how much.
5. The long-term climate impact caused by global warming.

Extreme Climate Change

As for all risks there are uncertainties in the estimates, and warming could be much more extreme than the middle estimates suggest. Feedback loops could mean global average temperatures increase by 4°C or even 6°C over pre-industrial levels. Feedbacks could be the release of methane from permafrost or the dieback of the Amazon rainforest. The impact of global warming would be strongest in poorer countries, which could become completely uninhabitable for the highest range of warming.

Mass deaths and famines, social collapse and mass migration are certainly possible in this scenario. Combined with shocks to the agriculture and biosphere-dependent industries of the more developed countries, this could lead to global conflict and possibly civilisation collapse. Further evidence of the risk comes from signs that past civilisation collapses have been driven by climate change.

Current risk

5 key factors:

1. How relations between current and future nuclear powers develop.
2. The probability of accidental war.
3. Whether disarmament efforts will succeed in reducing the number of nuclear warheads.
4. The likelihood of a nuclear winter.
5. The long-term effects of a nuclear war on climate, infrastructure and technology. A new category of global risk.

Nuclear War

The likelihood of a full-scale nuclear war between the USA and Russia has probably decreased. Still, the potential for deliberate or accidental nuclear conflict has not been removed, with some estimates putting the risk in the next century or so at around 10%. A larger impact would depend on whether or not the war triggered what is often called a nuclear winter or something similar – the creation of a pall of smoke high in the stratosphere that would plunge temperatures below freezing around the globe and possibly also destroy most of the ozone layer. The detonations would need to start firestorms in the targeted cities, which could lift the soot up into the stratosphere. The risks are severe and recent models have confirmed the earlier analysis. The disintegration of the global food supply would make mass starvation and state collapse likely.

Current risk

5 key factors:

1. What the true probability distribution for pandemics is, especially at the tail.
2. The capacity of international health systems to deal with an extreme pandemic.
3. How fast medical research can proceed in an emergency.
4. How mobility of goods and people, as well as population density, will affect pandemic transmission.
5. Whether humans can develop novel and effective anti-pandemic solutions.

Global Pandemic

An epidemic of infectious disease that has spread through human populations across a large region or even worldwide. There are grounds for suspecting that such a high-impact epidemic is more probable than usually assumed. All the features of an extremely devastating disease already exist in nature: essentially incurable (Ebola), nearly always fatal (rabies), extremely infectious (common cold), and long incubation periods (HIV). If a pathogen were to emerge that somehow combined these features (and influenza has demonstrated antigenic shift, the ability to combine features from different viruses), its death toll would be extreme.
The world has changed considerably, making comparisons with the past problematic.Today it has better sanitation and medical research, as well as national and supra-national institutions dedicated to combating diseases. But modern transport and dense human population allow infections to spread much more rapidly, and slums can be breeding grounds for disease.

Current risk

5 key factors:

1. The extent to which humans are dependent on the ecosystem.
2. Whether there will be effective political measures taken to protect the ecosystem on a large scale.
3. The likelihood of the emergence of sustainable economies.
4. The positive and negative impacts on the ecosystems of both wealth and poverty.
5. The long-term effects of an ecological collapse on ecosystems.

Ecological Collapse

This is where an ecosystem suffers a drastic, possibly permanent, reduction in carrying capacity for all organisms, often resulting in mass extinction. Humans are part of the global ecosystem and so fundamentally depend on it. Species extinction is now far faster than the historic rate, and attempts to quantify a safe ecological operating space place humanity well outside it. Many of the problems of ecological degradation interact to multiply the damage and (unlike previous, localised collapses) the whole world is potentially at risk.
It seems plausible that some human lifestyles could be sustained in a relatively ecosystem independent way, at relatively low costs. Whether this can be achieved on a large scale in practice, especially during a collapse, will be a technological challenge and whether it is something we want is an ethical question.

Current risk

5 key factors:

1. Whether global system collapse will trigger subsequent collapses or fragility in other areas.
2. What the true trade-off is between efficiency and resilience.
3. Whether effective regulation and resilience can be developed.
4. Whether an external disruption will trigger a collapse.
5. Whether an internal event will trigger a collapse.

Global System Collapse

An economic or societal collapse on the global scale. The term has been used to describe a broad range of conditions. Often economic collapse is accompanied by social chaos, civil unrest and sometimes a breakdown of law and order. Societal collapse usually refers to the fall or disintegration of human societies, often along with their life support systems. The world economic and political system is made up of many actors with many objectives and many links between them. Such intricate, interconnected systems are subject to unexpected system-wide failures caused by the structure of the network – even if each component of the network is reliable. This gives rise to systemic risk, when parts that individually may function well become vulnerable when connected as a system to a self-reinforcing joint risk that can spread from part to part, potentially affecting the entire system and possibly spilling over to related outside systems. Such effects have been observed in ecology, finance and critical infrastructure such as power grids. The possibility of collapse becomes more acute when several independent networks depend on each other.

Exogenic risk

5 key factors:

1. Whether detection and tracking of asteroids and other dangerous space objects is sufficiently exhaustive.
2. How feasible it is to deflect an asteroid.
3. Whether measures such as evacuation could reduce the damage of an impact.
4. The short- and long-term climate consequences of a collision.
5. Whether our current civilisation could adapt to a post-impact world.

Major Asteroid Impact

Large asteroid collisions – with objects 5 km or more in size – happen about once every twenty million years and would have an energy a hundred thousand times greater than the largest bomb ever detonated. A land impact would destroy an area the size of a nation like Holland. Larger asteroids could be extinction-level events. Asteroid impacts are probably one of the best understood of all risks in this report.

There has been some discussion about possible methods for deflecting asteroids found on a collision course with the planet. Should an impact occur the main destruction will not be from the initial impact, but from the clouds of dust projected into the upper atmosphere. The damage from such an “impact winter” could affect the climate, damage the biosphere, affect food supplies, and create political instability.

Exogenic risk

5 key factors:

- Whether countries will coordinate globally against super-volcano risk and damage.
- The predictability of super-volcanic eruptions.
- How directly destructive an eruption would be.
- The effectiveness of general mitigation efforts.
- How severe the long-term climate effects would be.

Super-volcano

Any volcano capable of producing an eruption with an ejecta volume greater than 1,000 km^3. This is thousands of times larger than normal eruptions. The danger from super-volcanoes is the amount of aerosols and dust projected into the upper atmosphere. This dust would absorb the Sun's rays and cause a global volcanic winter. The Mt Pinatubo eruption of 1991 caused an average global cooling of surface temperatures by 0.5°C over three years, while the Toba eruption around 70,000 years ago is thought by some to have cooled global temperatures for over two centuries.

The effect of these eruptions could be best compared with that of a nuclear war. The eruption would be more violent than the nuclear explosions, but would be less likely to ignite firestorms and other secondary effects.

Emerging risk

5 key factors:

- The true destructive potential of synthetic biology, especially the tail risk.
- Whether the field will be successfully regulated, or successfully manage to regulate itself.
- Whether the field will usher in a new era of bio-warfare.
- Whether the tools of synthetic biology can be used defensively to create effective counter measures.
- The dangers of relying on synthetic biologists to estimate the danger of synthetic biology.

Synthetic Biology

The design and construction of biological devices and systems for useful purposes, but adding human intentionality to traditional pandemic risks. Attempts at regulation or self-regulation are currently in their infancy, and may not develop as fast as research does. One of the most damaging impacts from synthetic biology would come from an engineered pathogen targeting humans or a crucial component of the ecosystem.

This could emerge through military or commercial bio-warfare, bio-terrorism (possibly using dual-use products developed by legitimate researchers, and currently unprotected by international legal regimes), or dangerous pathogens leaked from a lab. Of relevance is whether synthetic biology products become integrated into the global economy or biosphere. This could lead to additional vulnerabilities (a benign but widespread synthetic biology product could be specifically targeted as an entry point through which to cause damage).

Emerging risk

5 key factors:

1. The timeline for nanotech development.
2. Which aspects of nanotech research will progress in what order.
3. Whether small groups can assemble a weapons arsenal quickly.
4. Whether nanotech tools can be used defensively or for surveillance.
5. Whether nanotech tools or weaponry are made to be outside human control.

Nanotechnology

Atomically precise manufacturing, the creation of effective, high-throughput manufacturing processes that operate at the atomic or molecular level. It could create new products – such as smart or extremely resilient materials – and would allow many different groups or even individuals to manufacture a wide range of things. This could lead to the easy construction of large arsenals of conventional or more novel weapons made possible by atomically precise manufacturing.

Of particular relevance is whether nanotechnology allows the construction of nuclear bombs. But many of the world's current problems may be solvable with the manufacturing possibilities that nanotechnology would offer, such as depletion of natural resources, pollution, climate change, clean water and even poverty. Some have conjectured special self-replicating nanomachines which would be engineered to consume the entire environment. The misuse of medical nanotechnology is another risk scenario.

Emerging risk

5 key factors:

1. The reliability of AI predictions.
2. Whether there will be a single dominant AI or a plethora of entities.
3. How intelligent AIs will become.
4. Whether extremely intelligent AIs can be controlled, and if so, how.
5. Whether whole brain emulations (human minds in computer form) will arrive before true AIs.

Artificial Intelligence

AI is the intelligence exhibited by machines or software, and the branch of computer science that develops machines and software with human-level intelligence. The field is often defined as "the study and design of intelligent agents", systems that perceive their environment and act to maximise their chances of success. Such extreme intelligences could not easily be controlled (either by the groups creating them, or by some international regulatory regime), and would probably act to boost their own intelligence and acquire maximal resources for almost all initial AI motivations.

And if these motivations do not detail the survival and value of humanity, the intelligence will be driven to construct a world without humans. This makes extremely intelligent AIs a unique risk, in that extinction is more likely than lesser impacts. On a more positive note, an intelligence of such power could easily combat most other risks in this report, making extremely intelligent AI into a tool of great potential. There is also the possibility of AI-enabled warfare and all the risks of the technologies that AIs would make possible. An interesting version of this scenario is the possible creation of "whole brain emulations": human brains scanned and physically represented in a machine. This would make the AIs into properly human minds, possibly alleviating a lot of problems.

Emerging risk

5 key factors:

1. Whether there will be extensive research into unknown risks and their probabilities.
2. The capacity to develop methods for limiting the combined probability of all uncertain risks.
3. The capacity for estimating "out of-model" risks.
4. The culture of risk. assessment in potentially risky areas.
5. Whether general, non-risk-specific mitigation or resilience measures are implemented.

Unknown Consequences

These represent the unknown unknowns in the family of global catastrophic challenges. They constitute an amalgamation of all the risks that can appear extremely unlikely in isolation, but can combine to represent a not insignificant proportion of the risk exposure. One resolution to the Fermi paradox – the apparent absence of alien life in the galaxy – is that intelligent life destroys itself before beginning to expand into the galaxy. Results that increase or decrease the probability of this explanation modify the generic probability of intelligent life (self-)destruction, which includes uncertain risks. Anthropic reasoning can also bound the total risk of human extinction, and hence estimate the unknown component. Non risk-specific resilience and post-disaster rebuilding efforts will also reduce the damage from uncertain risks, as would appropriate national and international regulatory regimes. Most of these methods would also help with the more conventional, known risks, which badly need more investment.

Global Policy risk

5 key factors:

1. How the severity of non-deadly policy failures can be compared with potential casualties.
2. Whether poor governance will result in a collapse of the world system.
3. How mass surveillance and other technological innovations will affect governance.
4. Whether there will be new systems of governance in the future.
5. Whether a world dictatorship may end up being constructed.

Future Bad Global Governance

There are two main divisions in governance disasters: failing to solve major solvable problems, and actively causing worse outcomes. An example of the first would be failing to alleviate absolute poverty; of the second, constructing a global totalitarian state. Technology, political and social change may enable the construction of new forms of governance, which may be either much better or much worse.

Two issues with governance disasters are first, the difficulty of estimating their probability, and second, the dependence of the impact of these disasters on subjective comparative evaluations: it is not impartially obvious how to rank continued poverty and global totalitarianism against billions of casualties or civilisation collapse.

FUTURISTS IN ACTION

FACILITATING AN INDUSTRY CONFERENCE

The futures foundation was recently asked to provide a futurist speaker to close a two day industry conference for organisations dealing with people with disabilities. This is a very common request, since most speakers at industry conferences tend to come from within the industry, organisers are often keen to have someone "lift their delegates' eyes above the horizon" or "think outside of the box".

On this occasion the request came through with enough time before the conference for the futures foundation to convince the client that a futurist could make a bigger contribution to their conference.

After some discussion it was agreed that the futurist would act as the MC for the entire two days, and that the final session would be a combination of a summary of the conference and a venture into the future.

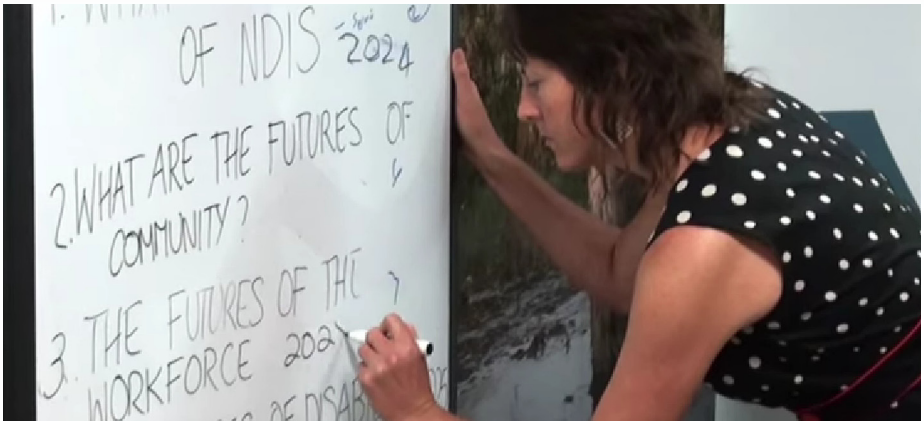
It was also agreed that the futurist would conduct a 45 minute session prior to the official start of the conference designed to give participants some simple ways of listening to the conference speakers with an ear to the future.

The optional pre-conference workshop was attended by over 80% of the conference attendees and focused on two key futurist themes:

before you venture into the future, first take time to understand how you arrived in the present

there is no such thing as "the future" rather there is a (probably infinite) space of potential futures

For conference attendees the first of these means listening to presenters with an ear to their particular perspectives (a less kind word might be biases). The present didn't simply arrive, it was created by choices made (and not made) in the past, and the way in which we see the present cannot help but influence the way we see the future.



To give a contemporary political example, many in the current Federal Government believe that anyone who cannot find a job is not looking hard enough. From this perspective a significant increase in long term unemployment simply confirms that there is a group of people in the community who will not make the necessary effort to get available work. The fact that some (or all) of these people might be disadvantaged in some way becomes at best a secondary consideration. Perhaps this explains why the current Government is currently restricting access to the National Disability Insurance Scheme.

The second futurist theme means recognising that presenters are just as selective about their choice of future perspectives as they are thinking about the past and the present. Listening for the sort of future which a presenter is espousing is a helpful way of noticing these selections. Those who are prepared to contemplate unexpected or unplanned futures are probably going to be the most interesting speakers – particularly if they are able to describe how these possible futures might emerge and what their consequences might be.

Some people see the role of a presenter as prescribing or at least anticipating 'the future'. Futurists encourage audiences to explore alternatives before deciding on the future they would like or support.

At this conference the speakers divided into two types – politicians or bureaucrats who described the future as seen through the lens of current government policy, and industry insiders who described the present in terms of either the difficulties they faced or the opportunities they saw.

As usual there was plenty of information for participants to absorb, but little direct opportunity to consider alternative future possibilities.

For this reason the futurist's summary included both a reminder of some of the key themes put forward by the speakers and a prospective venture into how some of these themes might play out in the future.

Her intention was not to prescribe the future but rather to explore options and possibilities. Her previous background in working with individual organisations in this sector was useful, but the insight that participants most comments on in their evaluations were those that took the presenter's ideas into novel, but useful, directions.

The organisers in their evaluation also indicated that having their eyes opened to possibilities they had not previously considered was the most valuable part of the futurist's contribution.

Book Review

by Charles Brass – Chair, futures foundation

Money and Sustainability: The Missing Link

by Bernard Lietaer, Christian Arnsperger, Sally Goerner and Stefan Brunnhuber
(published by Triarchy Press, 2012)

Our February newsletter contained a review of Alan Greenspan's latest book which is largely his take on the lessons to be learned from the global financial crisis.

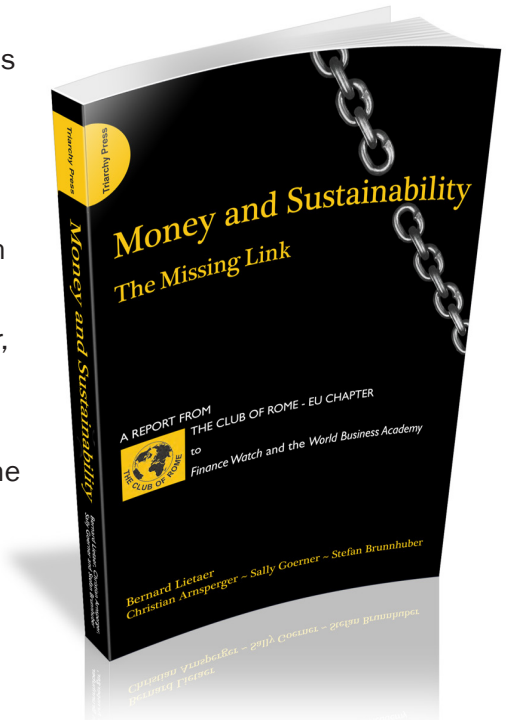
In this edition we review a book with an entirely different take on the same subject.

The lead author, Bernard Lietaer, has been active in money systems for 35 years in an unusual variety of roles. He has worked at senior levels within the Central Bank of Belgium, Gaia Hedge funds and the Belgian Electronic Payments System. He is the author of 15 books, many of which are available to be borrowed from the futures foundation library.

Bernard's co-authors in this book include an economist, a complex systems theorist and a PhD in both medicine and socio-economics. Together they set out to show that: "the current money system is both a crucial part of (our) overall sustainability 'problem' and a vital part of any solution" (p9).

The book is simultaneously a report from the Club of Rome, and in his introduction the Secretary General sets out why the book is needed:

> "Money, so we are told, is the root of all evil; it makes the world go round; but it can't buy us love. The truth is that money has become a central feature of our existence. It measures our economic growth,



our social status and our consumption habits. Two billion of us on planet Earth have nowhere near enough to live on, yet one percent of our population has more than it can ever use and flaunts it in a manner that frequently appals many of us. How could this have come about? How could a simple invention what had, at its heart, such laudable goal – to help people trade their commodities easily and effectively – go so wrong? Why have we this rift between finance and economy, between financial markets and the real economy they were meant to serve?" (p3)

The authors say that the book has three objectives:

- to provide evidence that the financial and monetary instabilities plaguing…the …world have a *structural cause* that has been largely overlooked
- to place the money problem, and the solutions to it, in the context of two global issues: climate change and population ageing
- to propose pragmatic solutions that can be implemented cost-effectively by citizens, non-profits, businesses or governments; solutions which would resolve *at a structural level* several critical instabilities currently facing many countries" (p10)

and they (like Alan Greenspan and any good futurist) begin by looking back at how our current attitudes to money and systems we take for granted emerged over the past 400 years or so.

Their major conclusion is that many structural elements of our current financial systems make booms, buts and instabilities inevitable. They reach this conclusion first by examining complex flow networks, of which economics is only one example. Systems theorists point out that the long-term viability of any complex system is dependent on a balance between efficiency and resilience. Efficient systems are able to process large volumes of the matter, energy or information which flows through them, and resilient ones are able to recover

from disturbances, attack or change in the environment.

In general, the more efficient a system the fewer pathways or channels through which its content flows, and the more resilient a system the more such channels there are. Clearly there is a tension between these two, and these authors conclude that current economic theory's focus on efficiency has come at the cost of its resilience to shocks.

So, they conclude: "…while monetary policies, appropriate regulations and bank management are important, there exists a flaw in the design of the monetary system which causes it to fail despite appropriate intervention." (p60). This design flaw (reliance on a monolithic focus on efficiency and ignoring resilience) means: "The difficulties we face can be compared to the difference between a driver and a car designer. A bad driver can wreck any car. However, a bad car design can make a car unsafe at any speed, so that even a superb driver would have difficulty driving it safely" (p66).

Not surprisingly given the breadth of the authors' experiences they painstakingly unpack this flaw and then in the second half of the book they propose solutions.

Essentially their overarching solution is to create multiple financial systems through which our economies would operate. Our current focus on a single national debt-based currency in every country is, they believe, simply unsustainable.

In two detailed chapters they give five examples of privately initiated parallel money stems and four government initiatives which are either actually in place, or under active consideration somewhere in the world.

To give a flavour for each of these, Doraland is a system proposed for Lithuania with the purpose of turning it into a 'learning country'. Doraland is a foundation which issues a currency called 'Doras' to anyone who undertakes an approved teaching activity. These Doras can then be trade with others, or redeemed in pursuit of an agreed new learning experience. The authors give the example of a 17 year old who wanted to learn Buddhism in Burma. The Doraland Foundation contracted to make this possible for a fee of 3,000 Doras. The 17 year old earned this amount by providing 300 hours of conversational English training to others, and the Foundation used its contacts through sponsorship and donations to provide the trip to Burma. The nationwide acceptance of such a system would dramatically increase the teaching and learning opportunities within the country without significantly affecting the national budget.

One of the proposed Governmental initiatives is extremely relevant and timely. It focuses on Greece which is being told the only way out of its current financial crisis is implementation of drastic austerity measures and public asset sales, or they must leave the Euro. These authors question why all the currency circulating in Greece has to be of one kind. They suggest that the Greeks could create a new currency – they call them Civics but I personally like Drachmas - which would only circulate within Greece. The Greeks would continue to use the Euro for all international business, tourism, shipping, exports and to service the country's national debt.

Civics would be issued by cities, regions or even the central government to fund the completion of agreed, important projects (these could be environmental, social or cultural). A civic would be earned each time a citizen completed an hour's work on such projects. The government would require every citizen to contribute a certain number of civics per year as their contribution to the government's operations. Those who earned these could simply hand them over. Those who didn't would be able to buy civics with their euros through appropriate brokers, and those who earned more than the government required wold be able to trade them with others.

These and other examples are explored in more detail in this report and in other of Lietaer's books[1].

As this is a report from the Club of Rome best known for its 1970 report "The Limits to Growth" it is appropriate that it ends with a chapter called "Beyond the Limits to Growth" in which the authors argue that: "history teaches us that even elites are not spared in a collapsing civilization" (p18). It is clear that there is an elite controlling our current economic and financial systems, perhaps it is time either for them to relinquish some control, or for the rest of us to demand a greater say. Otherwise more busts, crashes and recessions are inevitable.

[1] for example:

"The Future of Money - Creating new wealth, work and a wiser world", by Bernard Lietaer - Random House, 2001.

"People Money – The promise of regional currencies", by Margrit Kennedy, Bernard Lietaer and John Rogers – Triarchy Press, 2012.

"Creating Wealth – Growing Local Communities with Local Currencies", by Gwendolyn Hallsmith and Bernard Lietaer – New Society Publishers, 2011

all of which are available from the futures foundation library.

Signals in the Noise

SEVEN MEGAPROJECTS THAT WOULD CHANGE THE WORLD

Strait of Gibraltar (Image:LTCE/Getty)

We've built canals between oceans and tunnels under the sea. But some engineers are thinking bigger. Much,much bigger. All of us live in places that are engineered and designed," says megaengineering expert Stanley Brunn of the University of Kentucky in Lexington. So it's natural to dream even bigger, he says. Below are seven of the world's biggest schemes. Could we really go ahead with any of them? And should we?

1. Damning the Atlantic

It doesn't get much bigger than this. We could build a barrier across the Strait of Gibraltar, effectively turning the Atlantic into a huge dam reservoir. This was first proposed in the 1920s by German architect Herman Sörgel. With the flow of water into the Mediterranean reduced, the sea would begin to evaporate. Allowing it to fall by 200 metres would create 600,000 square kilometres of new land.

The environmental impacts of Atlantropa, as this plan is known, would of course be gargantuan. Perhaps most, er ,damning of all, lowering the Med by 200 metres would raise sea level in the rest of the world by 1.35 metres. "It's impossible in terms of the politics," says Richard Cathcart, a real estate adviser in Burbank, California, and a megaprojects enthusiast who has written several articles and books. "Academics are actually afraid to talk about big ideas," Cathcart says. With sea level set to rise tens of metres over the coming centuries because of global warming, Cathcart thinks the idea of a dam across the Strait of Gibraltar is worth revisiting. Instead of lowering the Med, a dam could maintain it at its current level, saving lowlying farmland from the sea as well as cities such as Venice and Alexandria. Egypt in particular would benefit. As things stand, rising waters will swamp large parts of the Nile delta and displace millions of people by 2100.

Signals in the Noise

SEVEN MEGAPROJECTS THAT WOULD CHANGE THE WORLD

2. TransAtlantic Aqueduct

Northern Africa could do with some more fresh water. The nearest potential source is the world's second largest river, the Congo, but it flows through a volatile, dangerous region. So why not tap the world's largest river, the Amazon, instead? All you'd need is a pipe. A very long pipe.

The idea of piping water all the way across the Atlantic has been around since at least 1993, when Heinrich Hemmer put it forward in a journal devoted to flights of fancy (Speculations in Science and Technology, vol. 16, p 65). He envisaged a pipe 4300 kilometres long, carrying 10,000 cubic metres of water per second, enough to irrigate 315,000 square kilometres. There the matter rested until 2010, when Viore Badescu, a physicist at the Polytechnic University of Bucharest in Romania, revisited the idea with Cathcart. They proposed to submerge a pipeline 100 metres below the surface, and anchor it to the seabed at regular intervals (Water Resources Management, vol. 24, p 1645). The pipe would have to be at least 30 metres wide, and have up to 20 pumping stations to keep the water flowing. It would start offshore in the plume of fresh water from the Amazon – water that has been discarded by the continent of South America", as Cathcart puts it. All in all, he estimates that the pipeline would cost about $20 trillion. Residents of the Sahara, start saving now. It might be wise to start a bit smaller – perhaps by piping fresh water 2000 kilometres from lush Papua New Guinea to Queensland. In 2010, businessman Fred Ariel announced plans for a feasibility study into a $30 billion pipeline. This year, the PNG government approved the idea in principle, but Queensland has said the plan is not under "active consideration".

3. Flood the depressions

In 1905, irrigation engineers in California accidentally flooded a depression that lay below sea level. The result was the Salton Sea, the largest lake in the state. There have been many proposals over the decades for flooding other lowlying areas.

The prime candidate is the Qattara depression in northwest Egypt, which lies as deep as 130 metres below sea level. It consists of 19,000 square kilometres of sand dunes, salt marshes and salt pans. The idea is to flood it with seawater from the Mediterranean, just 50 kilometres to the north. Generating electricity is the main motive: if water flows in at the same rate as it evaporates, generation could continue indefinitely. The "Qattara Sea" would become ever more saline, but surrounding areas might benefit from cooler, wetter weather (Climatic Change, vol5,p73).

The idea has been around since at least 1912, and the Egyptian government looked into it in the 1960s and 1970s. Few people live in the Qattara, so politically it is doable. The biggest problem is the sheer scale of the construction, which would require tunnels to go under a range of hills between the Mediterranean and the depression. One construction plan involved nuclear bombs. You may not be surprised that Egypt abandoned the idea.

Interest in the idea has revived recently thanks to Desertec – a plan to build a vast solar power plant in North Africa. Magdi Ragheb, a nuclear engineer at the University of Illinois at UrbanaChampaign, has proposed storing energy from Desertec by pumping seawater through a pipeline to storage facilities on top of the hills. When more electricity is needed, this water would be allowed to run down into the depression, turning turbines as it went. There would be no need for tunnels.

Flooding areas like California's Death Valley would also help offset sea level rise caused by climate change. But it is not worth doing for this reason alone: even if we flooded all of the world's major depressions, it would barely make a difference.

The Salton Sea, meanwhile, is not a great advert. It did thrive for decades, but it is now drying out and dying. Most fish can no longer survive in the ever-saltier water, and frequent foul smells and toxic dust are driving human residents away.

4. Join Asia and North America

The obvious place to link Asia and North America is at the Bering Strait (above), in between Russia's northeast corner and Alaska. At its narrowest point, the strait is just 82 kilometres across, and never more than 50 metres deep.

The idea of a bridge has been around since the 1890s. It would be the longest bridge over water, but not by a silly amount: the current record holder is the QingdaoHaiwan bridge in China, which spans a 26kilometrewide stretch of water. But the Arctic conditions, especially the sea ice, pose a huge challenge. Oil drilling companies like Shell have struggled to even explore in the area.

Signals in the Noise

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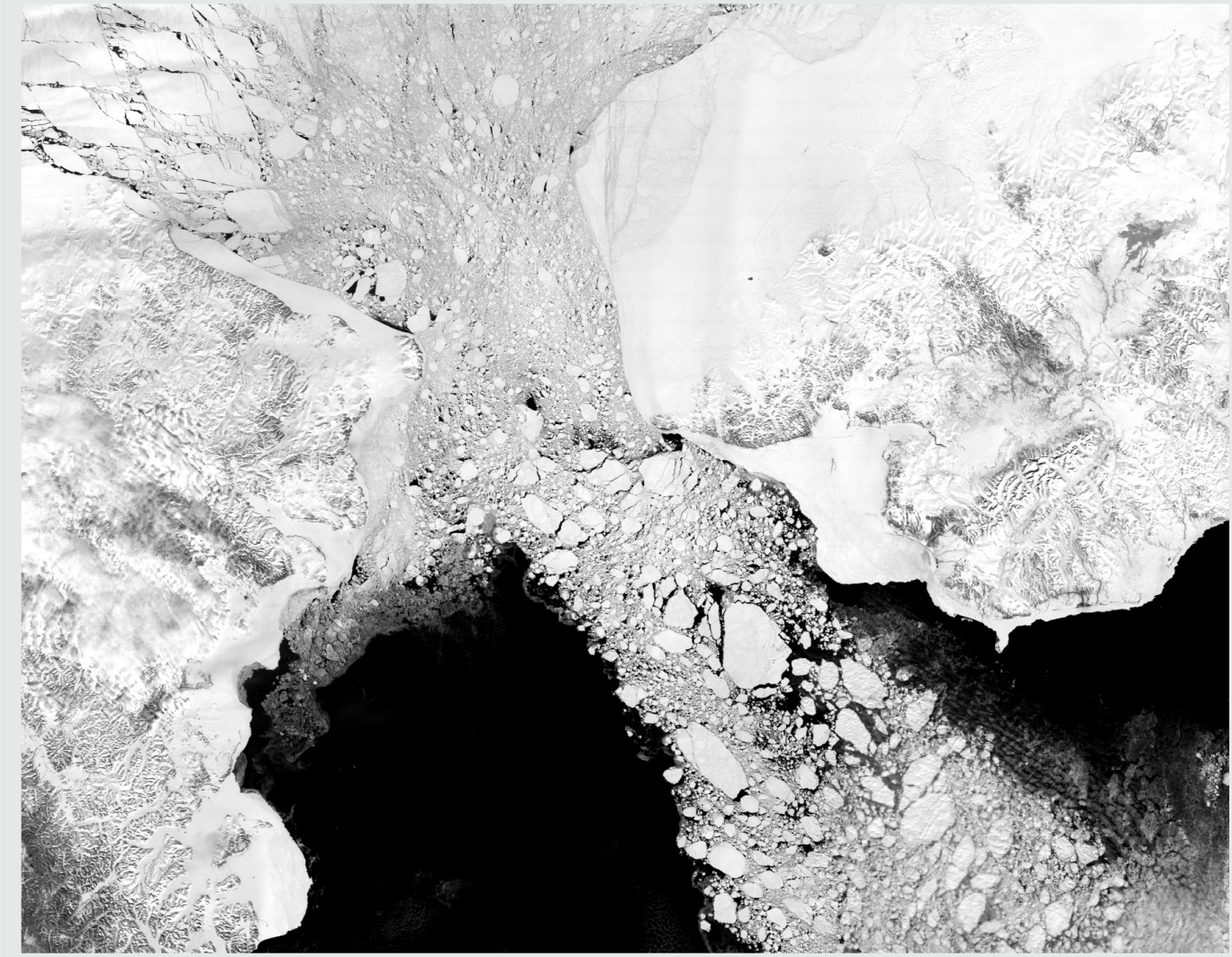

4. Join Asia and North America Bering Strait *(Image: George Riggs, NASA GSFC)*

That may be why Russia is more interested in tunnel. In 2007, its government announced the TKD-World Link,a railway that would link Siberia to Alaska by way of a tunnel. Seven years later, there is still no sign of the tunnel being dug, and relations between Russia and the US have soured. But perhaps China will take the lead: this year the Beijing Times reported that engineers there are hatching plans for a highspeed railway that would run from China to the contiguous US, via Russia, the Bering Strait, Alaska and Canada.

It may not be a recipe for more harmonious relationships, however. Twenty years after the Channel Tunnel physically linked it to the continent, the UK is considering breaking its political union with Europe.

5. Dam the Indian Ocean

Wherever there's a narrow bit of sea, someone has suggested installing concrete. The idea is usually to build a dam in a place where the water level on one side will drop because of evaporation. The resulting difference in height could be used to generate electricity.

There have been various proposals over the years but two stand out. In 2005, megaengineering enthusiast Roelof Schuiling, a retired geochemist at Utrecht University in the Netherlands, suggested damming the Gulf in the Middle East where it opens into the Indian Ocean. At one point, the Strait of Hormuz, it narrows to just 39 kilometres across.

SEVEN MEGAPROJECTS THAT WOULD CHANGE THE WORLD

The idea is not to do this anytime soon, because it is an important shipping route for oil tankers. But when this trade declines, Schuiling says, damming the Indian Ocean and allowing the level of the Gulf to fall up to 35 metres could generate 2500 megawatts of electricity (Marine Georesources & Geotechnology, vol. 23, p25).

There is an even bigger proposal out there: a dam across the Red Sea just before it joins the Indian Ocean, across the BabelMandeb Strait. That would require a dam wall 100 kilometres long, from Yemen in the north to either Eritrea or Djibouti in the south. Even Cathcart calls this "a little more wild". In 2007, he, Schuiling and their colleagues estimated it could generate around 50,000 megawatts of electricity (International Journal of Global Environmental Issues, vol. 7, p 341).

These projects would lower local sea level and create more land. However, as with Atlantropa, they would cause sea level to rise even faster elsewhere. What's more, without any exchange with the Indian Ocean the water in the seas would become steadily saltier, eventually destroying their entire ecosystems.

6. Build Land

Building artificial islands or peninsulas has become routine, with some astounding ones being made in Dubai, for example. But existing methods require deep quarries and deep pockets.

Schuiling thinks there is a cheaper way to create land. He has shown that injecting sulphuric acid into limestone turns it into gypsum, causing it to swell to up to twice its original size. So where there is limestone close to the surface of the sea, new land could be created. One such place is Adam's bridge, a narrow and shallow strip of shoals stretching for 35 kilometres between India and Sri Lanka. Schuiling thinks a land bridge could be created using his method for far less than the cost of a conventional bridge (Current Science, vol. 86,p 1351).

7. Relink the Pacific and Atlantic Oceans

Destroying the Isthmus of Panama, the slender strip of land that joins North and South America, would reunite the Pacific and Atlantic oceans. Underground nuclear explosions would do the trick. With the land gone, the ocean current that once flowed around the equator would restart and, allegedly, stabilise the climate (imanager's Journal on Future Engineering &Technology, vol.5, p 74). This idea is unlikely to be popular in Panama. What's more, some climate scientists think the closure of the gap 3 million years ago forced warm water in the tropical Atlantic to flow north, increasing humidity and snowfall in the Arctic and leading to the formation of the great northern ice sheets. If so, nuking the isthmus would hasten the loss of the Greenland ice sheet.

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