

Risk and Resilience

In this collection of blogs we look at a variety of aspects of risk and resilience.

Software resilience and security- BCS view



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BCS (the Chartered Institute for IT, formerly the British Computer Society) has recently answered a “Call for views on software resilience and security for businesses and organisations” from the Department for Culture, Media and Sport and the Department for Science, Innovation and Technology.

As background, it is important to note that software services are now delivered through complex tightly coupled systems, with unpredictable failure modes. This requires new approaches. Being known for reliable digital services in this new complex environment would add to UK’s competitiveness. The BCS report [itlf-software-risk-resilience.pdf](#) (bcs.org) describes the situation in more detail, and the National Preparedness Commission report [NPC_BCS_Software-Risk_-the-Elephant-in-the-Room_Dec-2022-Upload.pdf](#) (nationalpreparednesscommission.uk) concluded that “The software element of digital systems failure is a COST TO ECONOMY AND SOCIETY which will only increase as software has become a utility, is in wider usage, and more vulnerable to failure.”



In the answer to the call BCS has identified three complementary potential ways forward:

1. BCS is currently undertaking a project targeted at reducing the software risk and improving the resilience of the UK's digital services. The focus is on the resilience of operational digital systems in infrastructure sectors because:
 - Failures in infrastructure services would have dramatic negative effects on the rest of the economy including impeding growth and reducing productivity
 - The regulatory regimes of infrastructure sectors in the UK are oriented towards keeping costs to consumers down, rather than continuity of service or "keeping the lights on".

BCS is exploring whether guidelines for infrastructure sectors could be adapted from those published by the Prudential Regulation Committee for financial services.

2. The analysis makes recommendations on information sharing, so that organisations can make more informed decisions. Government could promote and support information sharing on failures of digitalised services. This would prompt Boards to take responsibility for resilience of the services supplied by their organisations. The sharing should include both breaks caused by cyber-attacks, and by software accidents. Government departments could take a lead on publishing failure data on their own services, using a framework based on that proposed for Regulated Data Service Providers by the Network and Information Systems Directive and Regulation, which addresses availability; integrity, authenticity or confidentiality; risk; material damage to users,
3. There is an emerging cross-government focus on improving the resilience of the UK economy. So in addition to information sharing the Government could be working with insurers on catastrophe insurance for cyber-attacks and software accidents. Insurers already play a key role in encouraging improved practice in safety and resilience. Clearly, any foresight work on resilience will need to take into account the key role of digital services in the economy and society.

Written by SAMI Emeritus Fellow Gill Ringland who is also a Fellow of BCS.

Published 27 April 2023



Widening Your Stakeholder Analysis



Image by Gerd Altmann from Pixabay

A good stakeholder analysis has always been an important part of policy or strategy development, especially in the area of futures thinking. Understanding whose interests to take into account, their motivations and concerns, helps you design an approach that is more likely to be acceptable, supported and effective. Over the years we have recognised that “stakeholders” extend more widely than the central decision-makers and power-brokers. Whether out of a genuine desire to be inclusive, or a more cynically self-interested wish to defuse opposition, addressing the needs of wider civic society has become a major element of stakeholder analysis.

Development Government policy already has to assess the impact of policies on the defined “protected characteristics”. We would imagine that the list of those to be considered (who are “stakeholders” in a sense) will only increase. In Australia, North and South America, the rights of indigenous peoples are increasingly protected, though the worldview underpinning the word “indigenous” remains in place. (Rather than the indigenous being a departure from the norm, they are really the default population, with the colonial immigrants being the deviation).

Widening “stakeholders” to include those as yet unborn is also an increasing trend, as is demonstrated in the Welsh Government’s Minister for Future Generations. Futures thinking is by definition concerned with change and how it affects people. Major trends and issues



like Climate Change, development of AI, geo-political dynamics all dramatically affect future generations and so it is almost obvious that someone should be advocating for their interests.

Where there is no formal advocate, people are turning to the law. A 2021 case in Germany's constitutional court ruled that: "one generation must not be allowed to consume large portions of the CO₂ budget while bearing a relatively minor share of the reduction effort, if this would involve leaving subsequent generations with a drastic reduction burden and expose their lives to serious losses of freedom".

Then there are the rights of animals. Are they "stakeholders" too? We are used to protected habitats, but should their general needs be properly represented too? In 2008, a parliamentary commission in Spain granted apes the rights to life, liberty, and protection from torture.

With the emerging threat of eco-system collapse, biodiversity should also be considered a stakeholder, especially in the area of urban design. Some have proposed a variation of the "participatory ladder" (Sherry Arnstein):

- non-participation: manipulation and therapy
- tokenistic participation: informing, consultation, placation
- citizen power: partnership, delegation and citizen control.

Acknowledging an active role for biodiversity as a 'non-human' stakeholder is a step towards proactive choices that enable 'biodiversity inclusive design'.

Others go further and argue for a greater differentiation of non-human stakeholders, with different characteristics, vulnerabilities, and needs.

Specific examples of these approaches include:

- Arguing that "sustainable development" initiatives in the Amazon rainforest simply imposed one technology rather than another, researchers suggest the forest should have the right to representation in court.
- Whanganui River in New Zealand became the first river in the world to finally be represented in court winning a million dollar pay-out from the Government.
- The "Rights of Rivers" campaign created a declaration stating that all rivers are:- Living entities; Entitled to fundamental rights; Entitled to legal guardians – and that: These rights shall extend to the health of watersheds and river basins; Indigenous communities will be represented in river guardianship; All states will implement these rights and provide the resources necessary to ensure they are realized.

If futures thinking is to explore the possibilities of change it is clear that we need to expand our thinking to recognise that the very essence of a system can also change.



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Written by Huw Williams, SAMI Principal

Published 11 May 2023



Prepare or Prevent: causes and events in futures thinking

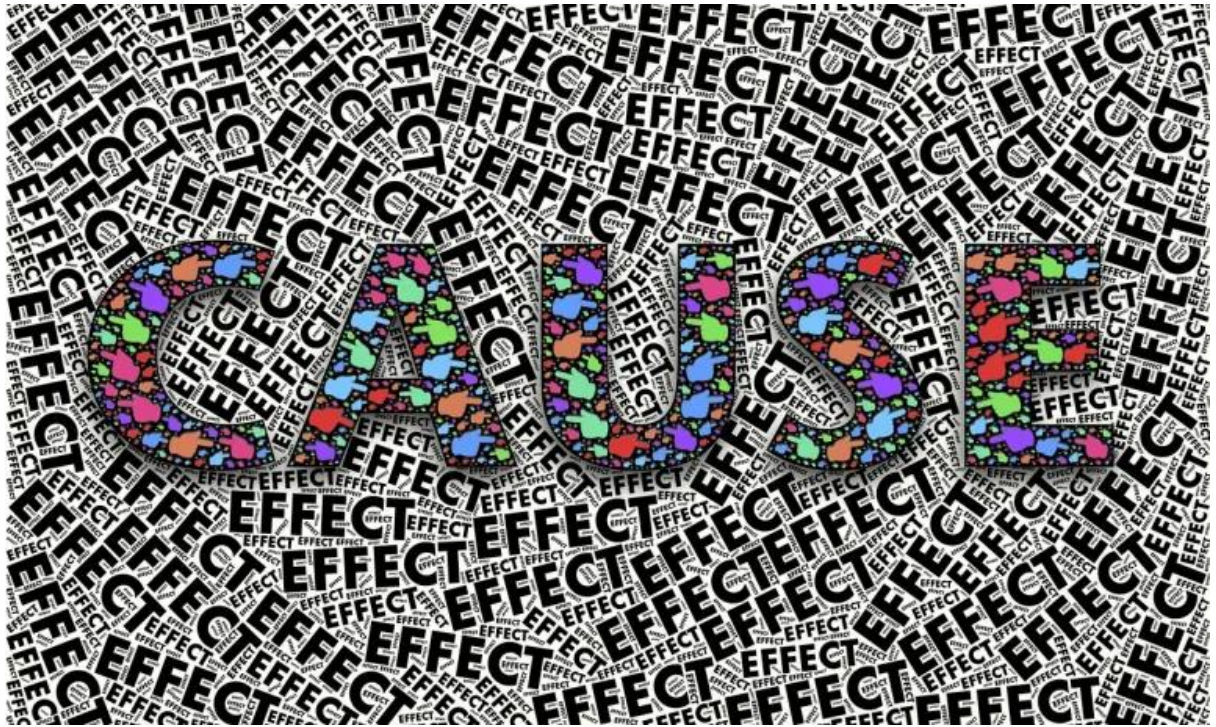


Image by John Hain from Pixabay

There's been a lot of discussion about the origin of the Covid-19 virus in Wuhan – did it appear in an animal market or did it escape from a laboratory? Arguably it doesn't matter.

First, it DID happen. The effects would have been pretty much the same whatever the origin. Pandemics were high on government national risk registers. The UK Government had asked “what-if” a pandemic happens and had a plan for pandemic flu. It had run exercises to test the plan. So we should have been ready.

Elements of the plan would need to be tailored to the particular characteristics of the virus (symptom-free transmission was a big issue). But there would be enough commonality to develop a general approach. This principle is widely recognised – NHS hospitals have “major incident plans”, which generally call for the suspension or diversion of routine consultations but also have a check-list of how to tailor plans to the situation.

Sir Oliver Letwin, who was Chancellor of the Duchy of Lancaster under the Coalition Government in effect holding resilience portfolio told the Covid-19 inquiry that “If they had been focused on impact rather than on cause, they might have observed that it was very



likely that, whatever particular virus it was that attacked us, it would require to be tested, to be traced, to have PPE associated with it, to have vaccines developed for it and so on”.

In some circles this is becoming known as “cause-agnostic resilience”. Letwin: “actually it’s the impacts that count and not the causes. Whether a biological agent is released by nature or by a state actor or a non-state actor, a terrorist, whether the whole of our critical national infrastructure goes down because there is space weather or because there is a cyber attack by a malicious party”.

This last point is a major area of concern for Letwin. His book “Apocalypse How?” explores the implications of a complete loss of power and communications across the country. We are increasingly reliant on integrated and networked systems. Despite most hospitals having back-up generators for power, the latest communication technologies mean that within a few years there will be little or no old-fashioned methods of communication, like a walkie-talkie.

We discussed the different aspects of resilience in a previous Working Paper. Second, it was preventable. Better regulation (or application of regulations) of animal markets would have prevented the virus leaping between several different hosts. Better systems and monitoring would have prevented leaks from a laboratory.

In other words, where identified risks have high impact and high probability, the appropriate strategy is reduce both. Minimise the chance of the event happening by pre-emptively working out what to do to prevent it. But at the same time plan for what to do should the event nonetheless occur.

These two fundamentally contrasting philosophies reflect two different approaches to futures thinking – scenarios and visioning.

SAMI often approaches futures thinking using scenario analysis. We generate future possible worlds (either by a scenario cross approach or some other method) and ask “what-if” this were to occur. Which of your current policies would be challenged, what new opportunities might emerge, how would you need to build different policies? We can move on from there to build an “adaptive plan” – a base case plan covering the current situation and most likely elements of the future, supported by several contingency plans that can be brought into play when your monitoring identifies that a trigger point has been reached. This is essentially a reactive methodology. The scenarios are generally wider than just one risk, allowing planning for opportunities as well as threats.

Visioning, combined with Backcasting and Roadmapping, is based on a totally different philosophy of the future – that rather than reacting to the slings and arrows, you take arms against the sea of troubles. It is essentially proactive – what do I want to the future to be and what do I need to do to make it happen? In many ways this is more akin to standard strategic planning, with the view that I can act to shape the future.



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There are limits to the Visioning approach however. Whilst we can minimise the chance of an event happening we probably cannot eliminate it entirely. Letwin criticises the probabilistic approach to planning: “events with huge impacts that are very unlikely [may] nevertheless have huge impacts..... can we, for a tiny amount of money, prepare properly to deal with it in advance?”. The Deepwater Horizon disaster was described by the then BP CEO as a “black swan” event because it was the result of a series of failures of elements of the system and so very unlikely. Clearly, though, envisaging a catastrophic failure should have been within the scope of any scenario-based approach.

As always, the right approach to adopt for your particular circumstances will depend on the context and will most likely be a combination of all the ideas above. . By leveraging both philosophies, we can hope to navigate the uncertainties of the future more effectively, ensuring a more robust and resilient world for the generations to come.

Written by Huw Williams, SAMI Principal

Published 28 June 2023



New National Risk Register announced.



Image by Mohamed Hassan from Pixabay

The Government has formally announced and published an updated version of the National Risk Register. It is the external version of the National Security Risk Assessment, and provides the government's updated assessment of the likelihood and potential impact of a broad range of risks that may directly affect the UK and its interests. In accordance with the principles of the UK Government Resilience Framework to communicate risk information in a more open and accessible way, this version is more transparent than ever. Nonetheless, some risks in the NSRA remain classified.

The Government makes a distinction between:

- 'acute' risks: discrete events requiring an emergency response; and
- 'chronic' risks: long-term challenges that gradually erode our economy, community, way of life, and/or national security.

The NRR focuses on acute risks only.

The NRR includes information about 89 risks, within 9 risk themes – although several risks could be categorised under more than one theme. These are:

- Terrorism
- Cyber



- State threats
- Geographic and diplomatic
- Accidents and systems failures
- Natural and environmental hazards
- Human, animal and plant health
- Societal
- Conflict and instability

For each of the risks report sets out a “reasonable worst case scenario” (RWCS) – ie one that discounts extremely unlikely events. This is then assessed for **likelihood** and **impact**.

- “Likelihood” is an expert assessment of the chance of the reasonable worst-case scenario occurring within 5 years for non-malicious risks and 2 years for malicious risks;
- “Impact” is assessed over a range of 7 broad categories but is boiled down into three main areas: number of fatalities (with “Catastrophic” being over 1,000); casualties (over 2,000) and financial (tens of billions of pounds).

The risks are then displayed in a table. In the version below, we have focused on the catastrophic risks (regardless of likelihood) and the most likely risks regardless of impact. We have also listed the risks with “Significant” impact in the 5%-25% likelihood range.

IMPACT	LIKELIHOOD				
	< 0.2%	0.2% - 1%	1% - 5%	5% - 25%	> 25%
Catastrophic	Civil nuclear accident; Overseas radiation leak		Large scale CBRN attack; Failure of National Grid	Pandemic	
Significant				Attack on energy infrastructure; Severe space weather; Snow, low temperatures; Infectious disease; Nuclear miscalculation	
Moderate					Terrorist attack in public; Tech failure in financial market infrastructure; Disaster in Overseas Territories; Attack on UK ally
Limited					NI terrorism Assassination of public figure;
Minor					International terrorism; Major outbreak of plant pest



The risk of another pandemic is the most likely catastrophic event, upgraded in likelihood from the assessment 3 years' ago. Looking back at pandemics since 1900, and of course learning from the recent one, experts believe the RWCS to be an unmitigated respiratory pandemic, but the Government is planning for a range of others, including "Disease X", an unknown pathogen.

The related risk of an outbreak of an emerging infectious disease (such as Ebola or MERS) is assessed as being slightly less impactful ("significant" – up to 1,000 deaths), but clearly merits close attention.

Failure of the National Grid would also be "catastrophic" and, although having a slightly lower impact, the related risks of an attack on energy infrastructure and severe space weather are rather more likely. These are scenarios explored by Oliver Letwin in "Apocalypse How?".

Nuclear radiation risks, whether due to an attack or accident, are also potentially catastrophic. Even though assessed as lower likelihood (even down to being classed as "remote") must not be dismissed.

Technological failure at a UK critical financial market infrastructure is one of the highest impact most likely risks, and perhaps the one with the most commercial impact. Arguably, it could have been rated as "significant" impact given the systemic effect it would have on the economy. The report recognises that their criticality to the functioning of UK financial systems means a sustained outage could threaten the UK's financial stability, with impacts felt across the economy. However, it may feel that finance sector organisations will have ensured that their critical business services are resilient to severe but plausible scenarios.

Terrorist attacks of various kinds are given high likelihoods, with the risk of "assassination of a high-profile public figure" featuring for the first time. The murders of MPs David Amess and Jo Cox provide evidence for this, and the increasingly vitriolic environment of social media tends to support the assessment. The impact of these events is assessed as "Limited", though the report does accept that there could be civil outrage directed at communities to which perpetrators are believed to be affiliated.

Large organisations should probably consider the need for contingency plans for all 89 risks, and all 9 themes. Thinking through the implications of the more likely and more impactful risks is the least that needs to be done.

In many cases, organisations can build some generic resilience responses – "risk-agnostic" preparations and disaster recovery plans.

Written by Huw Williams, SAMI Principal

Published 13 September 2023



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“Risk tipping points”

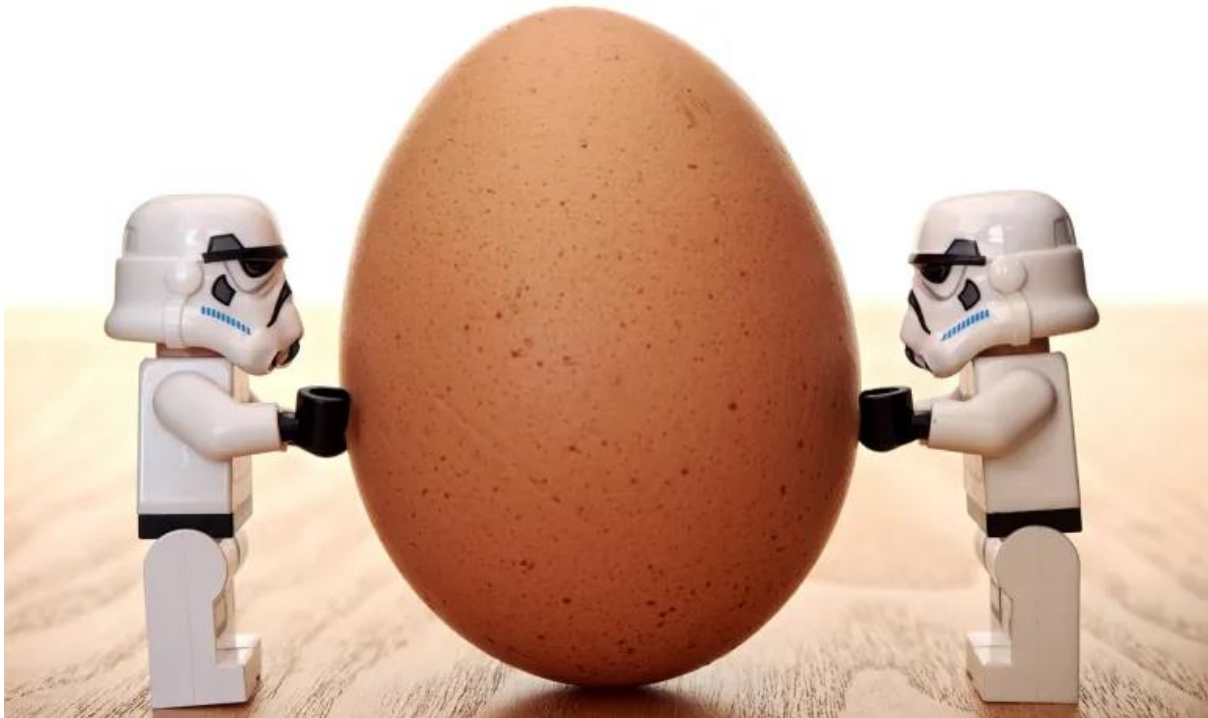


Image by Andrew Martin from Pixabay

The UN University Institute for Environment and Human Security has come up with a new characterisation of future uncertainties – “risk tipping points” (RTP). An RTP is defined as

“the moment at which a given socioecological system is no longer able to buffer risks and provide its expected functions, after which the risk of catastrophic impacts to these systems increases substantially.”

We have become familiar with the concept of tipping points in climate change, where positive feedback loops emerge and global heating races away. The distinction here is that UNU are looking at the system as a whole, with complex interactions between climate, ecology, society and technology. In their analyses instability slowly builds until suddenly a tipping point is reached and the system changes fundamentally or even collapses, with potentially catastrophic impacts. Once an RTP is crossed it can be difficult if not impossible to get back the original state.

The *Interconnected Disaster Risks* report 2023 identifies 6 risk tipping points, 5 of which relate to climate change in some way, which is perhaps not surprising given the EHS’s area of interest.



- **Accelerating extinctions:** “The extinction of a strongly connected species in a given ecosystem can trigger cascading extinctions of dependent species, which can eventually lead to ecosystem collapse.”
- **Groundwater depletion:** “When the water table in a given aquifer drops consistently below the well depth, access to groundwater will become problematic, increasing the risk for farmers to be unable to irrigate their crops.”
- **Mountain glaciers melting:** “When glaciers retreat, long-term ice storage melts and is gradually released as meltwater. Initially, the volume of water released increases until a maximum is reached, known as peak water. After this tipping point, glacier meltwater volume decreases as the glacier continues to shrink with effects on freshwater availability for humans and other species.”
- **Unbearable heat:** “Being exposed to above 35°C wet-bulb temperature for longer than six hours will result in a healthy, young, resting adult in the shade and wind suffering extreme health consequences. This threshold becomes far lower as other factors are considered, such as age, medical conditions or activity level.”
- **Uninsurable future:** “Increasingly severe hazards drive up the costs of insurance until it is no longer accessible or affordable. Once this point is passed, people are left without an economic safety net when disasters strike, opening the door to cascading socioeconomic impacts in high-risk areas.”

The outlier RTP is one of my favourites, **Space debris:** “ When there is a critical density of objects in orbit around Earth, such that one collision between two objects can set off a chain reaction, it will cause our orbit to become so dense with shrapnel that it becomes unusable. This would threaten our ability to monitor, for example, the weather and environmental changes, and to receive early disaster warnings.”

The report also identifies common root causes and impacts.

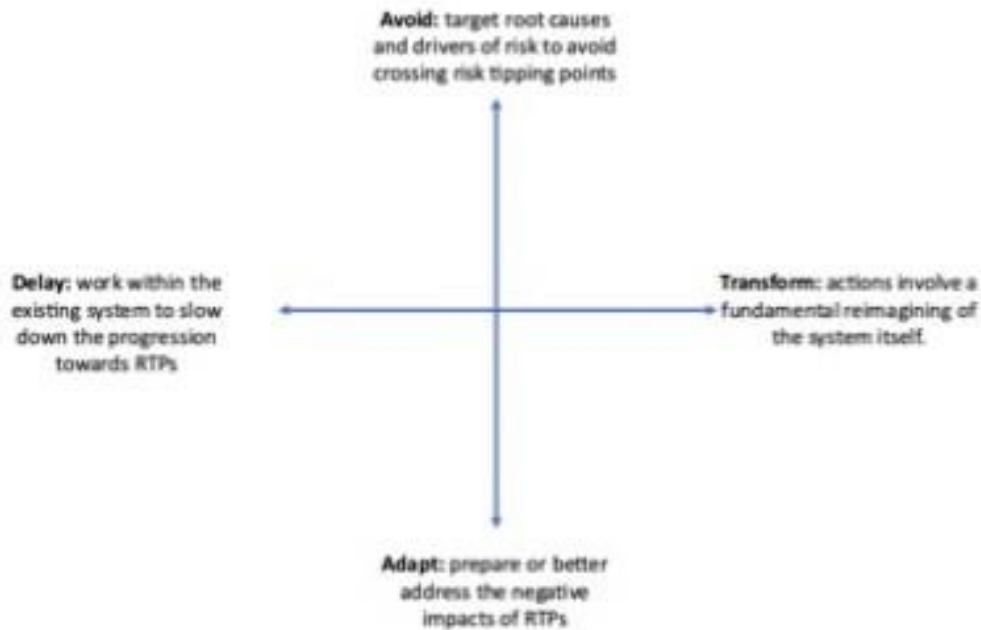
ROOT CAUSES	IMPACTS
Human induced greenhouse gas emissions	Livelihood loss
Insufficient risk management	Ecosystem damage & biodiversity loss
Undervaluing environmental costs	Health impacts
Insufficient cooperation	Loss of life
Prioritizing profits	Infrastructure damage
Global demand pressures	Migration/displacement
Inequality of development and livelihood opportunities	Water insecurity
Colonialism	Food insecurity
	Loss of safety



	Loss of opportunities
	Cultural heritage loss

Although EHS focussed on climate change drivers, one can see applications of the concept in other fields – the Hamas attack on 7th October could perhaps be characterised in this way, as it is hard to see the political situation reverting to its previous state. An AI singularity certainly qualifies.

They also try to identify some common **solutions**, proposing a framework to classify and discuss their effectiveness, across two dimensions:



The solutions this leads them to are:

- Being a good ancestor
- Being one with nature
- Creating a world without waste
- Cultivating a global neighbourhood
- Designing an economy of well-being

These are all very laudable of course, but they are more akin to aspirations rather than solutions. They are also dissociated from the analytical framework, which does actually look like it could be a helpful way to structure thinking.

For example, the descriptions of “Being a good ancestor” is:

“Future generations are at the mercy of the choices we make. This can start with designing our systems with the recognition of potential future risks, considering future generations as



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stakeholders in our plans today, and acting out of precaution for negative impacts down the line rather than maximizing short-term gains over long-term losses.”

There is no suggestion of HOW to make any of this happen – it’s just a wish. Challenging the root causes of “prioritizing profits” and “Insufficient co-operation” requires major political upheaval and a radical movement of its own.

The main lesson from this work is that the future is indeed complex with many inter-relationships between uncertainties, and that the socio-economic system is inherently unstable and liable to state shifts.

Written by Huw Williams, SAMI Principal

Published 22 November 2023