# SUSTAINABLE DNA FOR POLICY MAKERS

By Christopher Gleadle
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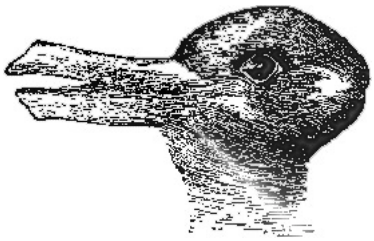

To demonstrate a paradigm shift, Wittgenstein created the Duck / Rabbit illusion.

What we see here is how a paradigm shift enables the same information to be seen in an entirely different way.

This paper is intended as an overview and is not intended as a complete statement of views, opinions, proprietary methods tools or examples

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**Executive Summary**

Climate Change abatement and improving UK economic performance can be synonymous with one another. Real long-term jobs, the economy and investor confidence can be boosted through addressing Climate Change and achieving beyond the Paris agreement.

*"The more we proceed with the transition towards a de-carbonised world, so more and more do we need to innovate at a system level to achieve productivity gains, inclusivity, cohesion and zero waste outcomes."* CMG

With insights from many examples, Sustainable DNA for Policy Makers takes you from big ideas to practical workable solutions.

While the paper follows a familiar sector headings format you will quickly sense the interdependence between the sections as they illustrate a paradigm shift to Sustainable Viability.

This is very important because, in order to achieve harmony and equilibrium across the policy spectrum, it is essential to be able to see the interconnectedness of all sectors. Without that vision, policies will conflict, and momentum will fade.

We therefore remove the paralysing effect of the siloes and disconnected thinking of 'Green', or 'Low-Carbon' and take you on a journey where tackling multiple environmental social and economic impacts together delivers better, rigorous and validated results.

Real-world examples will clearly show where current policies designed to improve emissions have the unintended consequences of promoting misbehaviour and flawed reporting that worsen emissions and environmental impact.

You will be shown routes to close the skills gap to the workplace. We discuss start-ups, SMEs and gaining long-term Investor Confidence. How to invigorate flagging apprenticeships. Eco-Innovation Centres that combine symbiotic start-ups, academia, industry, energy, agriculture

and finance to create technological innovations that break free from incremental enhancement and deliver exponential improvement.

Sustainable Viability aims to dispel the paralysing effect of the “silo mentality” and direct the alignment and integration of every facet of an economy through optimising:

- Workplace talent, problem solving and decision making
- The impact of design on products and services
- Boost symbiotic Eco-Innovation and growth
- Zero waste systems from feedback loops
- Utility of assets
- Effective communications
- Improved productivity
- Better risk management
- Investor Confidence

We discuss expansion of the Decision Space for Climate Change. Show how decisions in one function or sector can impact on another. To understand that just because it says ‘Green’ or ‘Low-Carbon’ it is not necessarily so.

It is important that if we are to deliver jobs, prosperity health and well-being in an environment that is safe for the nation’s future children then we must be transformative and do more than just better than yesterday.

**Introduction**

To flourish, sustainability must orientate from being process-obsessed to result-focused. Sustainability must bring transformative change and be more than just better than yesterday. Welcome in Sustainable Viability.

A sustainable entity (public or private) can be categorised as one that is capable of being maintained at a desired level of economic activity and performance with minimal long-term adverse effect on the environment or society.

Viability provides the conditions for an enterprise to succeed and prosper.

Sustainable Viability is the state of an enterprise that enables it to benefit its stakeholders, the environment and society increasingly and indefinitely.

Sustainable Viability (SV) is a well-validated, proprietary methodology that enables an organisation - its management, people and teams – to identify areas of the organisation where objectives are not aligned, opportunities are being missed, the environment is suffering damage, society is being disadvantaged and value is being destroyed.

Once these issues have been identified and exposed, the organisation is empowered to reimagine and redesign itself into an integrated, self-sustaining entity by harmonising systems and creating equilibrium.

The SV methodology will then assist management in measuring and validating the outcomes across the whole organisation using novel, proprietary modelling tools and rigorous impact accounting developed over many years.

Sustainable Viability aims to dispel the paralysing effect of a “silo mentality” and direct the alignment and integration of every facet of an organisation through optimising:

- Workplace talent, problem solving and decision making
- The impact of design on products and services
- Release of cash flow for eco-innovation and growth
- Elimination of waste
- Utility of assets
- Effective stakeholder communications
- Market positioning and disruption
- The organisational structure

The SV influence goes as far as providing the evidence for measuring and validating the SV outcomes using rigorous, holistic modelling tools. The anticipated outcomes are:

- Improved productivity
- Better risk management
- Increased customer satisfaction and retention
- Staff and community satisfaction, cohesion and well-being
- Elimination of wasteful processes
- Reduced environmental impact
- Profitable reprocessing of waste
- Better management information
- Strengthened economic profit
- Harmony and equilibrium
- Sustainable Viability

**The Power Sector**

The power sector can benefit from a more systemic approach. Wind, solar, storage, bio-energy can be combined into a system that both dissolves the challenges of energy security as well as balance demand-side requirements with the excess being exportable as a valuable income.

Such an integrated approach ameliorates performance of the whole. When modelled rigorously this approach imbues confidence in investors.

Investors can with confidence support sustainable systems in contrast to the current situation where project owners receive tax payer's money to merely support their lifestyle.

If a for-profit project or industry needs tax payer's money to support it, then it is not sustainable. There is something wrong with the design, the management, the structure. There is a lack of equilibrium.

Single, stand-alone technologies at best can be improved only incrementally, while systems can be improved exponentially.

With these thoughts in mind, FIT and RHI payments could be re-thought. For example, outputs from systems approaches in Anaerobic Digestion can be improved significantly, better refined and more variable to meet with a wider range of market needs - metropolitan / local / national. System approaches would allow the current blanket methodology of payments be replaced.

Through reconsidering payments, the tax payer is moved away from supporting inefficient projects under the blanket banner of being "Green", "Low-Carbon", which at best have seriously flawed performance. From my experience such attitudes and "siloed" thinking have unintended consequences for climate abatement. The tax payer ends up supporting economic misbehaviour and poor productivity.

By establishing integrated systems operators, from amongst gas, electricity, heat, renewables, bio-energy etc will, for example, enable greater collection of waste. Waste instead of being exported remains as a highly valuable resource onshore and removes the export impact.

Taking a whole systems-approach will require legislation, a reorientation of “Green” or “Low-Carbon” payments, as well as the upskilling of the workforce.

To fall short of these recommendations will undermine the forecasts for the UK ‘Green’ Economy and its ability to export. Moreover, the UK ‘Green’ economy is highly likely to compress under the weight of foreign competition who are more agile with a young population immersed in multidimensional systems approaches that for them and our competition leads to better and quicker problem solving. This will be illustrated later in this document.

To be bold and ground-breaking means to break free of the gravity and paralysing effect of isolated, disconnected silo thinking.

**Heat in Buildings**

Design and its effect on behaviour has the greatest impact in this area. Design in this respect is the design of systems, products, services, buildings and the infrastructure that supports the eco-system of buildings. Design should not be limited to just products.[0]

Deep retrofitting may produce the jobs detailed in Clean, Green and Carbon Free. However, surely it is the viability of the solutions that creates highly skilled long-term work and will be a draw for the export of skills, technologies and transfer of know-how.

We need to view the UK's aging building stock as an asset and not a liability. In the decarbonisation of our buildings we have the opportunity to create ground-breaking energy efficiency systems that can be exported. Such energy efficiency systems that are developed within our challenging conditions can then be used as benchmarks in both retrofitting and new-build configurations for heating and cooling use. This also would allow improved design and use of systems for entirely different climate regimes from the UKs. For example, where the use of Air-conditioning from HVAC is the norm. Where there is considerable waste from poor or no-load balancing of systems. Where the heat from the HVAC is not utilised. Where entire energy systems are over-resourced.

Viewing our aging building stock as an asset also allows us to support the TUC in their vision of improving "Low-Carbon' skills. Not only support, but exceed expectations as the parameters of low-carbon skills also have to be:

- Multidisciplinary
- Multidimensional
- Problem Solving

[0] Sustainable Viability and its Effect on Design (appendix 1)

From a bold Government position, we need to look at our education system for Eco-Innovation. Through Eco-Innovation will we design better, more durable, and verifiably more efficient products, buildings, appliances and services with ever less need for fossil fuels.

## Education Needs to Integrate Sustainable Eco-Innovation[1]

The importance of education to well-being and prosperity is clear. The application of Sustainable Education is less well understood yet is increasingly recognised as fundamental to addressing the critical global challenges we all face. By building students' capacity to innovate, Sustainable Education is essential to re-orienting the way we live and work and becoming a sustainable society.

Implementation of Sustainability has shown to improve morale and retention in business (Sirota 2011)[2]. Additionally, it has also shown that students who learn in the context of Sustainable Education are found to be more motivated, better behaved, and more present in class (Hacking, 2010)[3]. This suggests Sustainable Education aspires to educate students to understand how to make decisions that balance the need to preserve healthy ecosystems with the need to maintain vibrant economies and equitable social systems.

To be effective and create the multidisciplinary problem-solving skills needed to meet the aspirations of the UK, Sustainable Education is not just a new course; it's a pedagogy, which should underpin the curriculum and facilities management of all educational establishments. It must link those establishments to the local economy. When implemented comprehensively, Sustainable Education will increase student achievement with a firm grasp of how a sustainability lens elevates multidimensional systems thinking and creativity. This, in turn, will enrich the interdisciplinary nature of education, contributing to social, economic, and environmental benefits to the school or college, as well as proving to be an incubator for business innovation: making it viable, stable and therefore Sustainable.

[1] The Five Essential Steps to Sustainable Viability

[2] *Sirota Survey Intelligence (2007) Corporate Social Responsibility Contributes To Bottom Line, Improves Worker Engagement And Customer Loyalty.*

[3] *Barratt Hacking, E., Scott, W. and Lee, E. (2010) Evidence of Impact of Sustainable Schools. Nottingham, United Kingdom: Department for Children, Schools and Families.*

Education for Sustainable Viability and Eco-Innovation - coordinating education, business and government - will assist in giving coherency to the myriads of sustainability projects, which currently are fragmented and incoherent, with no measurable capacity delivering a poor return on investment (economically, environmentally and socially).

No Sustainably Viable business would operate in such a manner.

## Why Integrated Sustainability Matters

In applying multidimensional systems thinking (the essential ingredient for authentic sustainable financial analysis and reporting) within the curriculum, and applying to practical, real world, day-to-day situations, will highlight how to measure impact, and analyse the findings materially to understand relevance and meaning, which can be applied to any workplace position. This will teach students vital teamwork, problem solving and decision-making skills for business – the lack of which is a constant complaint of business, illustrating a major skills gap in the UK[4].

The application of Sustainable Viability will close a major vulnerability to future UK economic competitiveness. For example, on average, across OECD countries, about one in five students is only able to solve very straightforward problems – if any – provided that they refer to familiar situations. By contrast, fewer than one in ten students in Japan, Korea, Macao-China and Singapore are low-achievers in problem solving[5]. This suggests the UK Economy is suffering the risk of economic vulnerability against competitive countries. Holistic, balanced Sustainable Education will help place the UK at the forefront for skilled and motivated young people essential to the UKs economy in a highly charged, highly competitive, resource constrained market place.

*Sustainable Education is a compelling framework within which to learn and prepare students for work.*

[4] *British Chambers of Commerce survey of 3000 firms, 2014*

[5] OECD (2014). PISA 2012 Results: Creative Problem Solving: Students' Skills in Tackling Real-Life Problems (Volume V). Paris: OECD Publishing. doi:10.1787/9789264208070-en

To close the skills gap for the workplace is to have incoming individuals who understand the ecosystem of sustainability and Eco-Innovation and how it applies to an economic system as well as at an individual level.

I believe this will positively impact student outcomes; developing communication, collaboration, and critical-thinking skills to narrow the skills gap to career readiness by committing to academic excellence, while developing global competencies, and work-place capacities.

As a footnote to this suggestion for Sustainably Viable Education, education is for all. For all ages. As discussed, it brings the work-space and academic-space together in collaboration. I suggest too there is an opportunity to convert another perceived liability into an asset. Our community of prisoners. There are a great many who with the right support and injection of skills vital to our economy and our Government, will become useful and productive members of society to help boost further our flagging economy and reduce burden and waste all so often unseen.

## Use, behaviour and measurement

As described in Clean, Green and Carbon Free, the CCC has ambitions to eliminate the UKs buildings emissions by 2050:

*Experts perceive the UK as lagging behind most other countries in its efforts on energy efficiency, placing it 27 out of 28 among EU Member States, down from 13th in 2012. It has also been noted that there is a low overall level of policy ambition in the UK and that 'present policymakers do not see energy efficiency as an opportunity', focusing instead on supply side policies. One report has cited expert views that Germany, the Netherlands and France had all recently adopted significantly better energy efficiency policies than the UK.*

Government investment in undertaking a root and branch approach to increase holistically the UK skills in Sustainable Viability has the opportunity to place the UK at the forefront of research and development in energy efficiency.

Furthermore, ICT (Information Communications Technology) can link workspaces and academic spaces together driving efficiencies and greater productivity in infrastructure and output measured over time. Uptake of such systems of technologies will continue to increase work-from-home driving efficiencies in transport, buildings, infrastructure, networks and a myriad of other interconnections.

Verification of savings is vital to avoid the double counting of environmental improvement. Moreover, current claims of net benefits will be further undermined and discredited since currently numbers are not verified over value systems. This leaves investors lacking in confidence which exposes risk to projects, people, economy and Government.

To drive 'eco-efficiency' it is important to be persistently mindful of the interconnecting systems that join the whole.

Take as an example, buildings and facilities management. Consider how the buildings are used by humans, the services that supply buildings and their inventory. The combination of these elements will determine the actual load required to run fitted out space, and the intensity of energy use during work hours, which highlights a shortcoming of EPCs (Energy Performance Certificates) since they are based on intended design but take no account of (mis)behaviour.

Understanding the eco-system of building use and active collaboration between building owners and their users can drive efficiencies where shared value benefits all. The greater value created can be evidenced using simple tools that analyse and model prospective changes environmentally, financially and socially – leading to the creation of better work environments that improve the well-being of the building's users enhancing productivity. Tools that consider:

- o Energy
- o Water
- o Internal Environment (appeal, layout, access, light, air)
- o Pollution
- o Transport
- o Materials

- o Waste
- o Management
- o Inventory
- o Supply Chain
- o Embodied emissions, waste and impact
- o Others…

*"…there is little or no correlation between a building's design (as measured by its Energy Performance Certificate) and its actual consumption."*[6]

If the mass flowing out is less than the mass flowing in then there has to be a stream unaccounted for, which is typically a waste process – or, an input opportunity to another process. It is by conducting these exercises that the hidden value opportunities for eco-innovation are most often found.

Understanding resource and impact – environmentally, financially and socially - across the capitals of an organisation nudges toward better behaviour to maximise efficiency and make an effective choice. Choices impact the entire value system not just one element.

Let us consider a high impact choice being made in homes up and down the country. The heating of homes using wood burning stoves. These are a popular fashion. Wood burning stoves are sold under the banner of being "Green" and 'Low-Carbon".

The claim that burning woody bio mass is carbon neutral is simply false; the situation is actually being made worse. Trees increasingly absorb carbon over time when they are alive. When they are cut down it stops. To burn them releases the carbon (and other pollutants) into the atmosphere. New trees planted will absorb carbon, but only very slowly to start, and increasingly over time up to 100 years. This suggests a great many new trees need to be planted to replace one cut down and burnt.

[6] A Tale of Two Buildings; Jones Lang Lasalle 2012

The Stove Industry Alliance quotes on its website that burning wood could account for 10% of the UK Government Carbon reduction targets by 2020, with the potential to produce 25% of the Government's domestic renewable heat energy target by 2020. They support this with the following:

*Modern wood burning stoves are virtually carbon neutral when using current burn technology. High-quality wood emits less $CO_2$ when burned than it does with natural decay, so with correctly installed stoves producing emissions of only 0.008 kg $CO_2$ per kWh - compared to 0.198kg for gas, and 0.517kg for electricity - wood provides an attractive alternative to gas and electricity for heating the home.*

The figures are from DECC SAP 2009, Table 12. This report also features on the BRE site alongside the amended 2012 version.

Here is an area where regulation is needed. Organisations that use out of date, skewed and incomplete data to persuade an unsuspecting public that they are doing good, when they are actually doing bad must be regulated, and fined.

To be clear: to burn woody bio mass must include the combustion cycle (which this example highlights is not the case). Common sense. If you set fire to something you create pollution and you create emissions. You cannot offset them against a tree that may not absorb the same emissions for 50 to 100 years later.

The data that should be displayed is the following:

Wood Logs; 0.365 $kgCO2_e$
Coal; 0.34 $kgCO2_e$
Electricity (grid); 0.28$CO2_e$
LPG; 0.23 $kgCO2_e$
Natural Gas; 0.20 kgCO2e

Department for Business, Energy and Industrial Strategy
Department for Environment, Food and Rural Affairs

Full set of 2018 emission factors, version 1.01

*Outside of scopes factors should be used to account for the direct carbon dioxide (CO2) impact of burning biomass and biofuels. The emissions are labelled 'outside of scopes' because the Scope 1 impact of these fuels has been determined to be a net '0' (since the fuel source itself absorbs an equivalent amount of CO2 during the growth phase as the amount of CO2 released through combustion). Full reporting of any fuel from a biogenic source should have the 'outside of scopes' CO2 value documented to ensure complete accounting for the emissions created.*

Moreover, as Sir John Beddington recently explained; burning wood to produce electricity is both inefficient and in generating exactly the same amount of electricity, wood will release four times as much carbon into the atmosphere as gas would do, and one and half times as much as coal. In addition, Europe will soon need to burn an amount of wood greater than its total harvest - and precious habitats exploited. Sir John calculates that carbon emissions will rise by 6% or possibly more if wood is allowed to continue to provide more and more of Europe's energy output. The policy to burn wood in power stations flies in the face of the Paris Agreement ambitions.

*This thinking is also supported by leading luminaries such as the IPCC and Chatham House*

This is not the time to be fence sitting. Without even taking into account the impact of the logging trade, transport or even the manufacture of wood burning stoves, and their regulation, this example highlights the lack of verification and rigour of abatement data. It highlights how data is skewed to give biased information and serve personal aims. Such misbehaviour makes a situation less bad at best, not better. In this particular case, the situation is made worse. Notwithstanding, the site for The Stove Industry Alliance is proud of the fact that over 1,000, 000 stoves have been sold, and current sales are a further 175,000 units a year.

Disturbing also is that BRE feature such flawed data on their website. It is hardly surprising investors lack confidence in 'Green" and "Low-Carbon" labelled projects when industries support reports that lack completeness and are thus seriously flawed. This speaks to how the rosy pictures painted from the research and surveys contained in Clean, Green and Carbon

Free are flawed, leaving an industry painting false pictures from siloed and disconnected thinking.

This is an industry in need of urgent Government action and regulation. It is important to note that inadequate, incomplete, biased measurement and reporting is not isolated. It serves only those whose lifestyles are supported by “green money” diverting money from social care, the NHS and other important areas deserving of support and aid.

**Transport**

Liquid bio fuels for transport when seen in isolation have their own unintended consequences. Firstly, there is the battle between land for food and land for bio fuels. Jetropha, for example, can survive with little rain and poor soil conditions allowing it to grow on land that doesn't compete with land for food. Be aware however, that it is not grown on land impacted by forced labour (usually without payment), land confiscation (usually without compensation), extortion and arbitrary taxation, forced agriculture etc. For example, military orders to grow summer Jetropha plants for bio-fuel has taken place.[7]

Miscanthus is a popular alternative. It tolerates marginal lands and some flooding. It is more amenable to thermochemical conversion to biofuel than biochemical conversion, with good potential for the heat and power as well as animal bedding industries. But growth can encroach on agricultural land and replace food production because of its high yields and profit potential. Legislation in these areas has the potential to promote use on non-arable land, which could increase the value of total land stock through regeneration with GVA calculated through rigorous SV reporting.

Biodiesel made from partially renewable sources of oil such as soy or rapeseed has been heralded as an environmentally-friendly alternative to petroleum derived diesel. It can be used in diesel engines and studies have shown such fuel to be less polluting. However, quality has significant impact on emissions.

Bio fuels can cause health issues from particulate matter as well as other toxins present in the combustion of the fuel. Particulate Matter (PM) is present in the combustion of bio fuels. Measurement of the PM shows it to be much smaller in size than that found in fossil fuels; however, the concentration of PMs is typically found to be higher. The higher concentrations of PM have a hazardous effect on peoples' health, particularly in and around ports (shipping)

[7] Forced Migration / Internal Displacement in Burmah, Andrew Bosson, IDMC, 2007

and urban areas (road transport) with the associated costs of poor well-being, impact on health services and poor productivity due to respiratory illness.

Biodiesel made from vegetable oil, animal fat or waste grease is biodegradable and has high lubricity characteristics. Soy-based biodiesel, compared with diesel has been shown to yield 93% more energy than the fossil fuel energy that went into its production, and reduces GHG emissions by 41%.

However, biodiesel's claim to be a 'greener' fuel is not without some controversy. For example, de-centralised small-scale bio-diesel production leads to higher $NO_x$ emissions. As farm-based production is expected to increase this has the potential to become a major issue.

Biodiesel fuel consumption is typically higher due in the main to biodiesel's lower heating value, higher density and higher viscosity. Higher viscosity may affect cold weather performance and emissions. This would be particularly problematic to the UK.

Corn grain ethanol provides smaller benefits (25% net energy gain and a 12% reduction in GHGs). However, its main drag as a "green' bio fuel is that it has greater environmental and human health impacts because of increased release of air pollutants such as nitrates and pesticides. Therefore, biofuels would provide greater benefits if their biomass feed-stocks were producible with low agricultural input (i.e., less fertilizer, pesticide, and energy), and were producible on land with low agricultural value, and required low-input energy to convert feedstocks to biofuel.

Lastly, to understand the true effectiveness of biofuels the efficiency of the technology used to convert it to heat, electricity or a biofuel has to be understood. What systems are appropriate to raise that efficiency exponentially? This then allows GHG emissions per unit of energy to be calculated and compared with the GHG emissions from business-as-usual sustainability scenarios.

The recommendation here as before is to take a Sustainable Viability system view. Because the label says Bio fuel, and projects are labelled "Green" or "Low-Carbon" Government policy and financial instruments should rely upon rigorous SV reports. Failure to take an SV approach

will result in continuing what we have: supporting unsustainable projects to maintain the project owner's life styles delivering very poor value for money.

*"All that glister's green is not gold"*

## Driving behaviour

Behaviour can have a major impact on both emissions and fuel use – irrespective of type, if measured correctly by intensity over time.

From my extensive experience of both fleet management and developing novel fuel management tools and services, I revealed to clients that the impact of behaviour and behavioural types can vary fuel consumption, and other associated costs, by as much as a twenty-five percent measured across identical vehicles over time.

When working and contributing towards the Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Standard, and the GHGP Scope 3 Technical Guidance, my experience and knowledge changed the way fuel emissions were going to be measured to the calculations now used around the world today.

Moreover, I have found that incentives for hybrids, and ULEV, have done no more than support a lifestyle, by making motoring cheaper for those that can afford to buy the vehicles. I find Hybrids in real word situations that attain no better than a third of published headline fuel expectations and plug in hybrids that achieve no more than a quarter of published headline numbers. Tax payer's money given to induce purchase of such vehicles merely promotes misbehaviour, since the money provides for free running costs. It encourages extra driving not less since the cost of filling up is not seen as cash being taken out of their pocket. It has been given free by the Government.

Current policy making habitually focusses on one number and ignores the interplay of a system. This misbehaviour results in policy making that favours the rich and removes vital funds for NHS and other forms of social care for the vulnerable and disadvantaged.

Future policy and incentives need to be made based on intensity of use and not published headline numbers obtained from un natural testing regimes. Intensity is not the published

measure of $gCO2_e$ per Km driven, but actual fuel used over time. This can be petrol, diesel, or electric. The systems to capture the necessary data are in existence for example via road tax, MOT or insurance databases. The adding of one or two fields is all that is needed.

Payments and incentives should be made retrospectively in order to encourage better behaviour and not support misbehaviour. Think back to the banking crisis and how bonuses were paid on possible future outcomes that might not happen for five years or more. Remuneration regimes such as exist in banking did no more than encourage outrageous misbehaviour that delivered a global economic shock that destroyed the lives of many, but not those who were guilty of the original misbehaviour. Unless policy and incentives on transport changes, tax payer's money will continue to be wasted.

Driving radical behavioural changes as well as shifting from isolated metrics to combined metrics based on intensity over time will influence manufacturers' ability to design vehicles and power-trains to be more durable and more recyclable. Increasing verified and rigorous data gathered on behaviour and real-world use will give incentive to designers to understand where obsolescence can be designed out of manufacturing cycles, and value-driven durability designed in.[8]

As already illustrated, the behaviour behind operation of similar or identical vehicles must be incentivised that vehicles can at best, be designed and operate in a similar fashion.

### Shipping

Shipping too is at a crossroads and needs a similar approach to that outlined above.
The marine industry is under ever greater pressure to cut emissions since it delivers one fifth of all global emissions.

While we all look toward the International Maritime Organisation for guiding rules in the marine industry they face greater conflicts. Many countries, particularly Pacific Island sates, call for emissions capping. While, on the other hand, other countries such as Brazil and Panama resist emission capping for fear of reduced trade and damage to the marine industry.

[8] Sustainable Viability and its Influence on Design

The marine industry itself will talk about slow steaming, eco-ships of the future, high efficiency propellers, low-friction paint, known vessel performance. Shipping companies then resist rising regulatory scrutiny with its perceived extra costs of compliance.

At the same time, the consumer of internationally traded goods is becoming more and more conscious of the conspiring environmental and social risks and costs to their business yet struggle to know how to leverage these impacts for improved economic profit.

All fundamentally fail to understand how to deal with marine pollution, emission, waste and effectiveness while striving to increase the profits and well-being of both the industry and its people.

All is disconnected.

Policy in shipping must come of age and be fit for purpose. Policy that incentivises improvements in shipping intensity rather simple unconnected statistics. Such policy should aim at behaviour as well as ship design, maintenance, technology and operational practice. This would see multiple technologies come into play that, for example, would connect efficient utilisation of heat and power generated on a ship with reduction of waste and ballast water impact. Here we connect fuel use, emissions, marine pollution and the avoidance of invasive marine species.

Don't think 'Green' or 'Low-Carbon' think Sustainable Viability.

Policy in shipping must support the IMO in its efforts into the future by addressing multiple issues effectively and efficiently, rather than continue to incentivise misbehaviour as an unintended consequence of failing to understand the interconnectedness of multiple issues. Policy must incentivise systems of technologies rather than how technologies can operate on their own; policy that understands intensity over time, rather than pay now, and everyone pays again in the future. I shall illustrate this further within the chapter on industry.

A simple example of policy making looking at one statistic in isolation: the Government in China wanted to arrest the explosive growth of its population by implementing the one child

one family policy. What became clear very quickly was there would be a time when the aged population would not have enough young to support it. Well intentioned policy. Bad unintended consequence.

**Industry**

Resource efficiency and the Circular Economy. These are common entries to the corporate lexicon, and everyone is an expert. Yet, productivity of the UK is very low compared to other major economies – our competitors - causing a drag on UK economic development.

A paradox since resource efficiency and the circular economy should be synonymous with improving productivity.

From my experience resource efficiency has always been conjoined with rises in productivity, lowered emissions measured in terms of both carbon intensity and carbon absolute, improved customer service, better whole life accounting and improving economic profit.

What is measured badly is managed badly. Seeking function or sector specific pathways to efficiency will only achieve sub-optimal outcomes since efficiency applied in one sector but then not verified as to how it impacted across sub-sectors or parallel sectors will produce numbers that in reality cannot be confidently assured as climate improving. This naturally leads to a greater need of collaboration between sector bodies and Government agencies. Such collaboration suggests a need to upskill teams and their managers.

From my experience efficiency and the decisions taken to cut costs in the pursuit of efficiency rarely involve the measurement of whether the cost cuts taken add or destroy value.[9]

Government support into Eco-Innovation Centres could greatly help here. Eco-Innovation Centres must not be confused with standard innovation centres that, while are hubs to attract start-ups and connect them to investors, typically fail to attract investors who seek long-term return as part of a risk adjusted portfolio. SV Eco-Innovation Centres will be focussed to provide symbiotic innovations and services as an incubator for large scale industrials and Governments from around the world.

[9] The Five Essential Steps for Sustainable Viability, 2018.

SMEs face specific opportunities from the increasing demand for environmental products and services in the global market. SV Eco-Innovation Centres will aim to help SMEs develop comprehensive strategies and measurable action plans for eco-innovation.

SMEs will be supported to understand the new, rigorous, sustainably viable economic models that will be essential to compete effectively in a global market place. The Eco-Innovation Centre will offer a high-profile environment in which to combine the talents of academia, impact investing, government and business to create outstanding innovations that offer combined market-beating propositions.

As a hub for businesses in high-tech and low-tech innovations it will enable a secure future for:

### Energy

Design lower carbon, sustainably viable energy solutions from energy generation to consumption via feedback loops to better serve ever rising energy demand.

### Water

Directly connected with energy production are sustainably viable opportunities to produce water supply and waste water solutions. Only 0.007 percent of the planet's water is available to fuel and feed the world population (National Geographic). By 2025, an estimated 1.8 billion people will live in areas plagued by water scarcity (UN Water). SV systems will lead the world in both conservation, reuse and production.

### Natural capital

Land-use change due to infrastructure development, forestry, bioenergy, and food supply are driving habitat fragmentation and biodiversity loss. SV systems can support positive impacts on our global natural capital assets through better understanding of natural processes combined with innovative tools and technologies.

### Resource efficiency

In taking SV's influence within design, create production and consumption zero-waste systems that are optimally organised and drive transformational change.

### Waste

70 billion tonnes of material are used annually (OECD). This is estimated to be 1.6 times what the world can produce each year. SV supports resource efficient harmonized symbiotic

systems where waste materials are managed through solutions that offer greater efficiency, reduced environmental impact and serve greater needs.

### Food

In connecting all the above, SV Eco-Innovation centres can become embedded across multiple whole food supply systems. Applying innovation to the local economy for high quality nutritious food growth is an important step to secure export opportunities from a failing global economy in this sector.

## Training and development in Eco-innovation for SMEs

SV training modules can be focused on the development of SME "hard skills" related to innovation of products and processes, as well as development of "soft skills" focused on fostering a learning and collaborative culture in the organisation.

### Training and Capacity Building for SMEs.

Eco-Innovation in Start-Ups and SMEs suffers from a lack of directed and relevant training opportunities. Moreover, SMEs are in most cases not able to optimise the use of training. They are self-confident on their products and services yet have difficulties to see training as a growth factor.

The justification for training in the Eco-Innovation Centre is to open a targeted elaboration of successful training concepts which clearly visualise how training and its empowerment of Eco-Innovation is a growth factor for SMEs – which also promotes Sustainable Development.

### Hard Skill/Competence training

Aimed to give SMEs knowledge and methods which they can use toward their product/service development. This can also consist of transfer of innovation/application methods/financial /planning / & direct knowledge on eco-innovative strategies, science and technology, and value-chain impact management.

### Soft skills/Competence Development

The ability to use effective methods in problem solving/creative methods/innovation processes/conflict handling and knowledge management. Understanding the impact of mis-behaviour will help build learning systems and culture within SMEs so the entrepreneurs/owners start to view the learning process as key to growth.

### Didactic support systems

The training models must be further developed by use of train-the-trainer modules and optimised with the use of experts/study visit/building didactic models, which will optimise how training is combined with the production process.

### Multidimensional Learning models

Explore multidimensional learning models where training/advising/coaching and network building is based on the same terms and will provide multiple learning and development experiences.

### System Level

Within the systemic focus upon Start-Up and SME environment, it is also important to build upon the relationship between SMEs, their suppliers and their customers. Develop a comprehensive offer of advisory business services for Start-Ups and SMEs to raise awareness on eco-innovation.

The rationale is to create an enabling environment for SMEs to engage in eco-innovation activities and in eco-innovation collaboration.

Additionally, the programme will target selected SME support agencies, business networks and other SME intermediaries (e.g. chambers of commerce, Government Departments etc.).

### Building capacities of government to support eco-innovation in SMEs

Aimed to improve the design and implementation of Eco-Innovation policies to better account for the needs of SMEs.

- Pilot a project focused on creating such a dialogue

- Share existing successful practices to create participatory policy processes, which effectively involve SMEs into a dialog with policy makers and the policy making process;
- An SME intermediary is important in a dialog with the government. SMEs being a diversified and rather divided community will need to rely on this role being taken by the Eco-Innovation Centre.

The rationale is to create an enabling environment for SME Eco-Innovation by initiating dedicated policy measures. Such policy measures can be best designed if there is an open dialog between Government and SMEs on the needs and barriers.

The target groups of such dialog building programmes are:

- Governments
- Start Ups and SMEs
- SME intermediaries, such as SME associations, chambers of commerce etc.
- Academia

### Size of Programme

Building dialog can include building a physical platform for systematic discussion of specific barriers, opportunities, targets, design of new instruments, programmes, legislations. These discussions can be hosted by workshops or roundtables with the involvement of the public bodies (agencies dealing with industries, competitiveness, economy, SMEs, environment, legislative institutions), SME representatives, SME intermediaries, and independent experts.

Suggestions and recommendations would provide a basis for new policy measures to support Eco-Innovation in SMEs. The complementing activities could be informing all parties on innovative support measures that are successfully applied in other countries, to increase the awareness and help them to come up with the best policy package. Such a programme could be run during 1-2 years' period, and end with inviting other countries to gain lessons and discuss possibilities of adopting the experience.

As reported, the TUC recommends upskilling in Low-Carbon technologies. Eco-Innovation centres will become centres of systems excellence, where low-carbon is an output in a balanced sustainably viable manner. Using online communication tools Eco-Innovation Centres link work-space, education-space, innovation-space, and afford the opportunity to boost flagging apprenticeships in an exciting and innovative way that will provide the skills and productivity for the UK economy.

SV Eco-Innovation Centres will fulfil the potential for low-carbon opportunities in the UK. They will give credible currency to exceed the Carbon Trust's export aspirations of £30 billion and for the UK to more than double its share of the low-carbon global market to greater than 10%.

SV Eco-Innovation Centres will combat the increasing competition from China, SE Asia and other highly skilled and developed economies with the homegrown skills essential to dominate a green, low-carbon, low-resource, high productivity market place.

**Sustainable Bio-Energy, Agriculture and Land-Use Change**

Reorientation away from 'Green' or 'Low-Carbon' brings advances in lowering impact and raising productivity in the agriculture sector and making better use of land, and land-use change.

As agriculture struggles with understanding $CO_2$, $CH_4$ and $N_2O$ fluxes in relation to changes in land and land-use Government has an opportunity now to support agriculture through new and exciting policy changes that will truly benefit the production of food. New ways will be found to efficiently produce energy, expand 'Low-Carbon' 'Green' markets and create symbiotic relationships with industry and finance.

Nitrogen fixing crops established in poor quality soils is not a new idea but combining such plants to take advantage of marginal land and produce energy, natural potassium, phosphorous and nitrogen balanced fertilisers is. Also, for example, combining feedstocks with municipal waste and other high cellulosic inputs.

Such combinations elevate the outputs from Bioenergy plants and AD sites that currently run inefficiently and cannot survive economically without tax payers' input. The burden on tax payers is further increased in poor conversion technologies operating in a dysfunctional and disconnected manner, with no relation to the local, national or international markets for a greater range of outputs.

SV Eco-Innovation Centres can operate as a hub bringing together investors, universities, Government (Metropolitan / Regional / National) in developing and reimagining our nations towns and cities to become the SMART towns and cities of the future. But very importantly too, connect them to the rural communities to revitalise the heartland of the UK and export these fresh ideas.

To illustrate where insightful policy and 'green' money could be focussed:

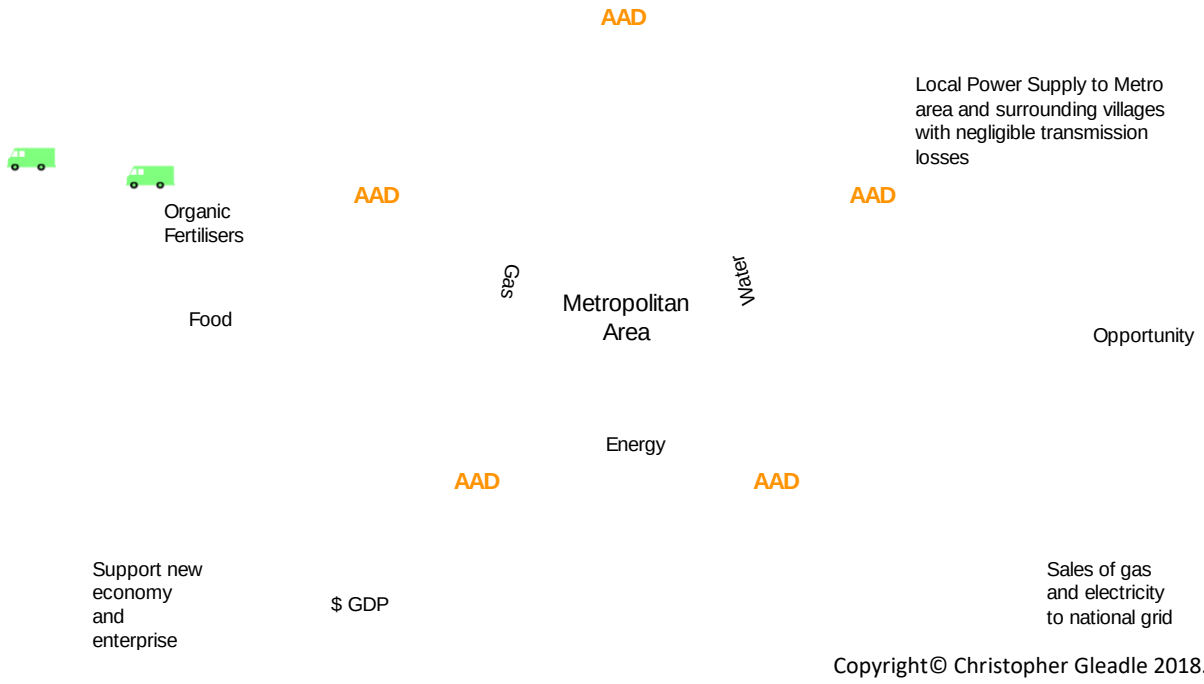



**Fig 1**

In developing fresh ideas for exponential expansion of Climate Abatement, rigorous impact accounting and authentic reporting will move beyond full life-cycle accounting. When there is a subjective term such as "full", what does "full" really mean? Life Cycle accounting is reliant upon scope and boundary. As illustrated previously, if scope and boundary are too narrow, impact is missed, reports skewed, and the real situation hidden. At best the outcome will be sub-optimal value for the tax payer, the environment, the economy and society as a whole.

It is through focussing on outcome and not processes that innovative and creative solutions are uncovered. Taking the illustrated example of the small-grid AD system (Fig 1), what if hydrothermal liquefaction was added into the system of a metropolitan plant. Not only do we have a system that can absorb all the municipal solid waste, but also feasibly convert

plastics to bio-oil, and from over production of digestates too, as well as wet wastes from agriculture. This would close the loop on production of waste and converting to valuable inputs to another production process based on a market need.

Significant too is the relevance of this system to wastewater treatment and its sludge. To lay the groundwork for application to other distributed wet wastes and blend together represents a significant resource of underutilized biomass.

The Gross Value Add to this integrated approach has also the potential to unlock the economic barriers for the use of algae. In fact, such a system represents an intriguing strategy for the valorisation of algal biomass and contribute to moving forward the boundary of knowledge on the technological application of algae. Within the sphere of the SV Eco-Innovation centres this again could make the UK at the forefront of 'Low-Carbon' 'Green' solutions and skills as a system that is sustainably viable.

In food waste there are many interconnected impacts which if tackled simultaneously would provide solutions to resource issues such as food, water and sewage in drought and war-distressed areas. Innovation can be incubated in the UK.

Food waste is of epic proportion. If food waste were a country it would be the third highest emitting country in the world.

Meat is often given a bad press, since focus is given to just one number and not the whole system. To focus on meat as a policy target could skew the intended effect and create more impactful unintended consequences.

For example, meat is a relatively low contributor to global food wastage in terms of volumes (less than 5% of total food wastage). Yet, it does have a significant impact on climate change, contributing to over 20% of the carbon footprint of total food waste (including methane from ruminants, fertilisers, manure management, feed production and such like). However, the highest carbon footprint of wastage occurs at the consumption phase (37% of total), whereas consumption only accounts for 22% of total food wastage. This is because one kilogram of food that is wasted further along the supply chain will have a higher carbon intensity than at earlier stages.

The emissions from overconsumption for the support of a natural healthy diet is equal to the impact of food waste. One impact you see, and one you don't. Over eating and associated known health issues add significantly to the burden of health and social services too.

Combine both the waste and over-consumption statistics to the transport and logistics (these links create 87% of global transport emissions[10]) that link both together and quickly you gain a picture that to individualise meat could well be a policy focus that misses the point.

Its behaviour that again needs to be policy focussed in the waste and over-consumption arena. High abatement impact can also be achieved by combining energy production and energy markets with food production that has the opportunity to create optimal solutions for climate abatement.

Imagine for example the reduction of water use and land use in addressing overconsumption, and how the shifting dynamics can make available cheaper nutritious food for all. Importantly too, such actions could allow for peatland restoration and conservation of wildlife delivering the benefits of an attractive peatland landscape while keeping food security in balance.

Combine further afforestation and reforestation. If scope and boundary are too narrow, then opportunities are missed, that rigorous impact accounting collects.

This is not to say that any one individual area cannot have some form of refined policy, but the above example illustrates, along with all previous examples, it is important to create policy not in isolation but holistically to create harmonised optimal systems of policy that are balanced and equitable.

However, one system can support another in equilibrium, but can only be optimised from a human perspective if viewed holistically (nature creates equilibrium quite happily on its own, its humans that keep causing disharmony). Policy makers can then break free from the gravity of siloed, isolated thinking.

[10] Food and Agriculture Organisation of the United Nations

Therefore, back to where we started with buildings. Wood for buildings, while is not a carbon sink, can help to create carbon sinks if viewed as a balanced harmonised system.

Increasing the proportion of wood in construction can facilitate a reduction in the use of other construction materials, such as concrete, steel and brick. These construction materials require a great deal of energy for their production and they entail higher emissions of carbon dioxide.

Other alternatives to low-carbon cementitious materials have been developed. They can be combined at different ratios to produce 'green' binders for the construction industry. The physical and mechanical properties are obviously important, but so too are the thermal properties to satisfy the requirements within environmental standards. Integrated SV impact accounting would scope-in low-carbon options for comparability before a more resource intensive life-cycle assessment approach is applied.

Such scoping would include reclamation and recycling into future materials/products, or downcycled to lower-grade uses. This also applies to existing structures and materials arising from demolition, refurbishment and excavation applying a further value to the UKs aging building stock, as well as pointing towards the ease and usability of brownfield land-use change.

Policy from an SV perspective would need to take a holistic helicopter view to not favour one renewable source over another to avoid an unacceptable risk of double counting, or worse, assuming an impact and emissions gain.

**Financing the Transition**

Increasingly, investors (Institutional, mutual or impact for example) make investments based upon some form of sustainability criteria - and integrate sustainability performance data in their capital allocation decisions.

However, few investors understand the need to distinguish between material and immaterial sustainability issues. There is a body of evidence which clearly demonstrates that firms which understand material sustainability issues significantly outperform firms with poor performance on these issues. This suggests that investments in sustainability issues are shareholder-value enhancing.

It must be noted also, firms with good performance on sustainability issues which are not material to the business do not underperform firms with poor performance on these same issues. This suggests investments in sustainability issues are at a minimum not value-destroying.

Therefore, firms with good performance on material issues and concurrently poor performance on immaterial issues perform the best. These results speak to the efficiency of firms' sustainability investments. This knowledge has implications for asset managers who have committed to the integration of sustainability factors in their capital allocation decisions.

Evidence has led to sustainability issues being strategically important and has led to the release of a wealth of information in the form of ESG (Environmental Social and Governance) data.

However, the materiality of the reported sustainability investments for corporate value is regularly questioned as many companies release an increasing amount of information that might be immaterial from an investment standpoint.

For example*, the UN Global Compact - Accenture CEO Study on Sustainability in collaboration with the Principles for Responsible Investment* shows that 88% of investors surveyed do see

sustainability as an opportunity for competitive advantage yet, only 38% of CEOs believe they can accurately quantify the business value of their sustainability initiatives, with only a meagre 7% of investors agreeing[11].

To date, financial regulators and central banks have largely focused on private sector disclosure to determine the magnitude of potential impacts of climate change. However, as evidenced above, there is increasing evidence that reporting in the private sector to be flawed due to siloed, disconnected reporting that also leads to a lack of investor confidence.[12]

All the while, there is increasing awareness of the physical and transitional risks climate change poses to financial markets and financial stability. We therefore have another paradox.

Both climate change (in the form of climate-related damages to productive capital) and the low-carbon transition (climate mitigation policies that impose reduction of greenhouse gas emissions and a shift to cleaner technologies) are likely to have severe implications for the functioning and stability of the macro-financial system.

In contrast, for central banks to incorporate climate change into operational decisions could be viewed as a breach of their goal to be market-neutral. However, even supposedly market-neutral interventions by central banks may show bias towards carbon-intensive industry incumbents.[13]

By mainstreaming climate considerations into their day-to-day operations and disclosing their approach to transitional risk, the Bank of England would send a strong signal to financial markets and begin to address their own tragedy of the horizon.[14]

SV takes a ground-breaking approach to how climate risk is accounted for. In creating harmonised systems visibility will be given to how climate risks are amplified by the direct effect on society and well-being and further adds currency to the value destructive force of disconnected 'Green' and 'Low-Carbon' approaches. Rigorous application of systemic ESG

[11] Companies Continue to Struggle to Communicate Sustainability Effectively – CSR Wire, Christopher Gleadle, 2014
[12] The 5 Essential Steps to Sustainable Viability
[13] The Climate Impact of Quantitative Easing, Grantham Research Institute
[14] Tragedy of the Horizon, 2[0] Investing Initiative, Mark Carney

considerations into investments decrease risk through better more informed decision making based on valorising impact accounting that includes Gross Value Add (GVA).

Such an approach to monetary policy would move the Bank of England to investigate the impact of their interventions on both high-carbon and low-carbon investment and could see the start of SV impact risk analysis being incorporated into credit ratings.

A harmonised system analysis of assets purchased would also allow comparability between purchases in carbon intensive industries and their low-level of GVA against 'Green' or 'Low-Carbon' investment. This would boost investments aimed at arresting climate warming to 1.5 degrees.

Additionally, the Bank of England, with other public institutions, would be nudged to acting within a harmonised policy system aimed at achieving an equilibrium of interventions for a rapid and smooth transition to a low-carbon sustainably viable economy.

**Conclusion**

It is now time for decision makers to expand their Decision Space for effective Climate Change abatement from industry and finance. It is time to identify all the factors that may impact upon decisions; identify as many unknowns and unintended consequences as possible; how decisions in one function or sector can impact on another; to understand that just because it says 'Green' or 'Low-Carbon' it is not necessarily so.

From the examples given in this paper, policy makers can begin to identify how current and future interdependent environmental challenges and socio-economic shifts are changing the role of business, Government and institutions in society alike. And, by applying multidimensional systems thinking create a harmonised policy landscape to optimise:

- Shift thinking towards achieving zero emissions
- Move away from analysing single data points and move towards integrated systems thinking in order to release greater economic performance
- Visualise cross-functional / cross-sector impacts that both add and reduce impact
- Reveal value cycles across whole systems
- Turn waste streams into profit centres
- Integrate new wisdom into financial and management systems
- Understand the changing face of Risk Management to forecast opportunity

It is self-evident that we cannot continue to draw from finite resources and continue to produce unwanted wastes indefinitely. Improved efficiency may produce less waste, but less waste is still ultimately unsustainable, even if the economic model shows a level of profit…

Understanding Sustainable Viability leads to seeing and understanding the interdependent connections between environmental and social impacts and the risks and costs they carry to the UK. Deep analysis of these connections reveals the UKs real opportunity and ability to become a nation of low-carbon excellence where we can export our skills and technological prowess.

**UK PLC**

In building a long-term sustainably viable economy and continue on the path as a world-leader in sustainability, innovation and cutting-edge technologies, the UK must see sustainability shift from being process-obsessed to result-focused. Sustainability must bring transformative change and be more than just better than yesterday.

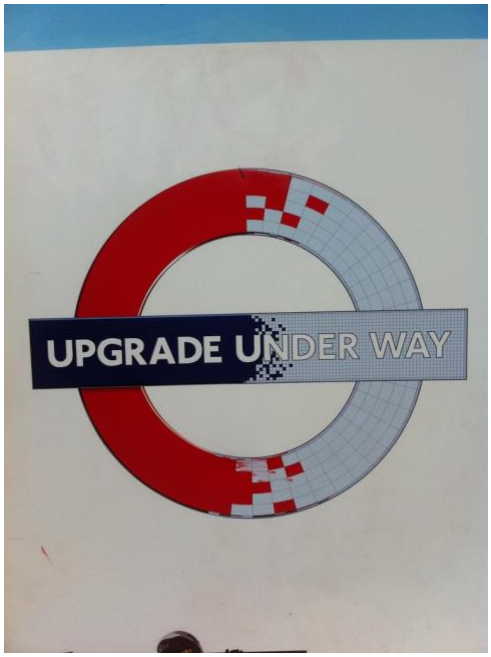
SV takes you from big ideas to practical workable solutions. It moves you from being a top individual contributor to a leader of people. It's a paradigm shift. People work for a manager, they do their best for a leader.

Real leaders move us. SV leaders move their organisations and the world

Martin Luther King did not say "I have a strategic plan"…

**Appendix 1**

# Sustainable Viability (SV) and its Influence Upon Design




The economics of design (project, product, service) is typically viewed in a linear fashion focused on processes and functions of return. The economics of design is more complex when taking account of environmental impact, social inclusion, well-being and behaviour.

While good design delivers value from design performance, SV influenced design creates more value by considering risks and opportunities revealed by the iterative SV Integrated Design Process.

The SV approach delivers rigour to material impact accounting. SV drives eco-innovation to capture, create and deliver more value to serve customers better.

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*The impact of design affects all processes that can ultimately betray or improve value economically, environmentally and socially.*

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**Example:** *working with a company, I redesigned the structure of the business, how strategy was implemented as well as sales, marketing and accounting approach. We co-created a new de-install service from the SV revealed opportunity to recycle and reuse rare earths and metals. This de-risked the business, de-stressed cash flow, reduced environmental impact and raised productivity. Further gains came from the new competitive tendering, contract supply and end-of-contract services all enabled by reduced whole life cost, supply and impact cycle. From disruption they reaped a market advantaged position increasing sales and margin. Employment increased in an employment stressed area.*

When the nexus of all impacts is fully understood, then all processes can be rigorously synthesised for optimal productivity and outcome. Confidence is delivered from validated reports.

Design affects all processes and will betray or improve value economically, environmentally and socially. **Fig 1**


**Fig 1** – The impact of processes

SV inspired design (project, product, service) is essential to the health of interdependent systems modelled through novel holistic SV tools.

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*Isolation of process and technology will allow only incremental improvement; SV allows exponential improvement.*

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- SV immerses organisations into a three-dimensional interactive world that accurately reflects the present situation and intended future.
- SV makes visible the direct and indirect impacts of design (project, product, service)
- SV enables the visualisation of the wider implications of decisions: on the organisation and environment now, and in the future.
- SV expands and diversifies the decision space to open up possibilities never before considered.
- SV spurs higher multi-disciplinary skill levels essential for interdepartmental collaboration
- SV increases the ability to problem solve.
- SV outcomes are rigorously modelled, synthesised and analysed with novel SV tools
- SV delivers investor confidence into investment decisions.
- SV improves staff retention, staff collaboration and user loyalty.
- SV through all the above impacts increases productivity

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*The world is not linear as demonstrated by the products of nature and the interactions between them measured over time. SV creates systems in a 3-D World*

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SV removes blinkers we simply did not know we had. SV uniquely avoids focus on just one aspect such as reducing carbon emissions or 'being green'. These concepts have their own consequences, since they are linear, typically subjective, and can perpetuate business as usual behaviour. Linear thinking misses the utility of exponential improvement that is freely available from SV actions.