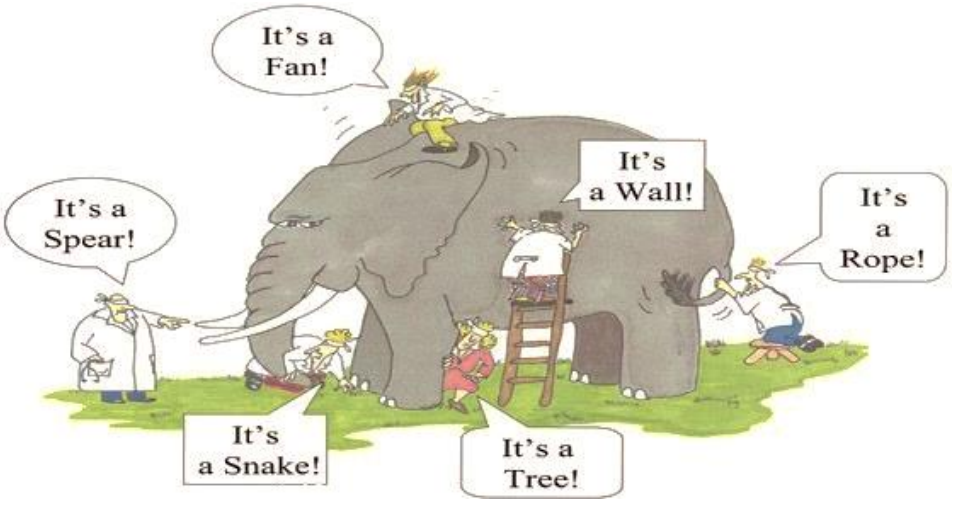
Demystifying Systems Thinking

Systems thinking is undoubtedly an important tool for informing effective decisions relating to sustainability interventions. However, to avoid it becoming a buzzword shrouded in mystique, there is need for greater clarity and rigour in its description and use. This primer aims to address misconceptions that may arise when systems-related terms are debated. It calls for greater rigour to ensure that the term does not become devalued by being misconstrued or presented as a solution for all challenges.

Defining systems and systems thinking

Donella Meadows – a renowned proponent of systems analysis – defines a **system** as "an interconnected set of elements that is coherently organised in a way that achieves something" (in Meadows, Donella H; Wright, D. (2009). *System Thinking: A Primer*. Earthscan Publications). **Systems thinking** refers to the way in in which it is defined and made sense of, and – self-evidently – **systems change** refers to the process of changing a system.

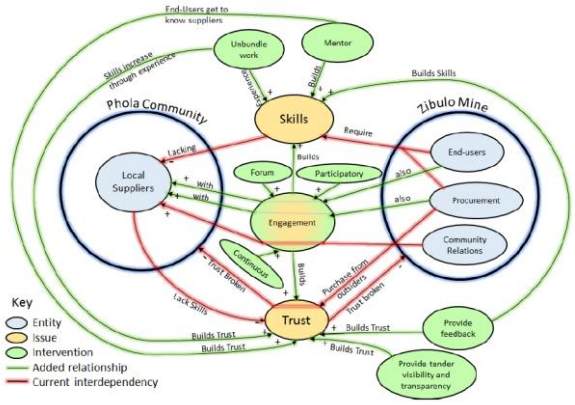
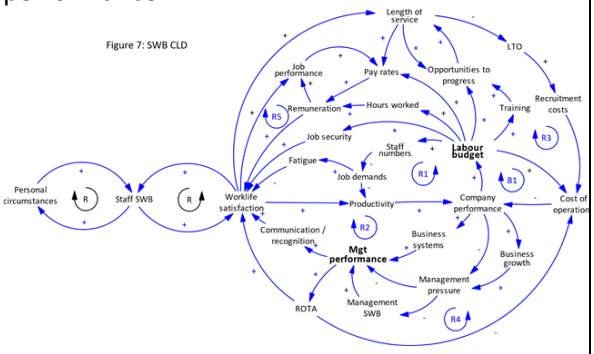
In a business context system thinking was popularised by Peter Senge's book The Fifth Discipline where it features as one of the five disciplines of 'learning organisations'. It has been described as a way of seeing and talking about reality, a perspective, and a school of thought that helps us better understand the interconnections between parts of a system and synthesise them into a unified view of the whole. It is argued that to enable better informed decisions for sustainability it is necessary to have a holistic understanding, which is sometimes illustrated using the 'blind men and the elephant' parable.



Example: The value of systems thinking – Urban mobility

The discourse around mobility tends to be dominated by technical innovations, such as EVs; however, while this requires some degree of system reconfiguration (e.g. charging facilities), it does not alter the wider transport system. A systems perspective reveals potential measures beyond vehicle improvements, such as: reducing car use through modal shifts from private cars to public transport, urban spatial planning that aims for residential, business and leisure space within walking distance (of public transport); and deducing mobility demand by teleworking, teleconferencing or internet shopping. Such analysis provides richer insights to inform decision-making by policymakers and business leaders.

There are a wide range for systems approaches, ranging from simple mapping to highly sophisticated modelling.

Examples of visual representations of systems	
Designing a local procurement strategy For her research Linda Wedderburn, MSt SL (Cohort 3), developed a schematic systems diagaram to depict the issue and interventions to be considered in designing a local procurement strategy and programme for a mining community.  	**Subjective wellbeing in a hotel business** For his research into subjective wellbeing at a hotel business Mark Parker, MSt SL Leadership (Cohort 6), developed causal loop diagram (CLD) dynamic hypothesis was developed. It portrays that there are two key workplace factors that impact work life satisfaction, i.e. the labour budget and management performance. 

Despite prominence of ‘systems change’ in the sustainability field, the Director, Systems Change at Lankelly Chase Foundation warns that:

> *There is the danger—particularly when a new approach or phrase emerges—that the language and the buzz that surrounds it creates a mystique, making it inaccessible and daunting to many who seek to create lasting change. It can become the preserve of a small elite rather than owned by all. The term systems change is one such example. This is made harder by the fact that there is no agreement on what systems change is, and there are many different ways of approaching it depending on who you are, what place you hold in the system, the type of power you have, and the issue you are responding to.*

Here are some of the common misconceptions that may arise when systems related terms are debated. Greater rigour will ensure that the term does not become devalued by being misconstrued or presented as a solution for all challenges.

1. Misconception: Systems are large-scale.

The word 'system' is often used in a manner that implies global or large scale**.** When used in a scientific sense, there is no such automatic association with scale and the system thinker/analyst is at liberty to define the boundaries of the system of interest. The scale can range from, for example, process optimisation within a factory to modelling interactions between the earth and humans at a global scale, as was the case in the seminal Limits to Growth study commissioned by the Club of Rome.

The choice of boundary is not straightforward and is always a matter of judgement and perspective. Whatever boundary is drawn, different ones are likely to be possible and their analysis may point to different interventions being appropriate. Developing the elephant analogy – the scale of interest could be the microorganisms within an elephant, the elephant's interactions with other animals, or the migration of elephants across a wider landscape.

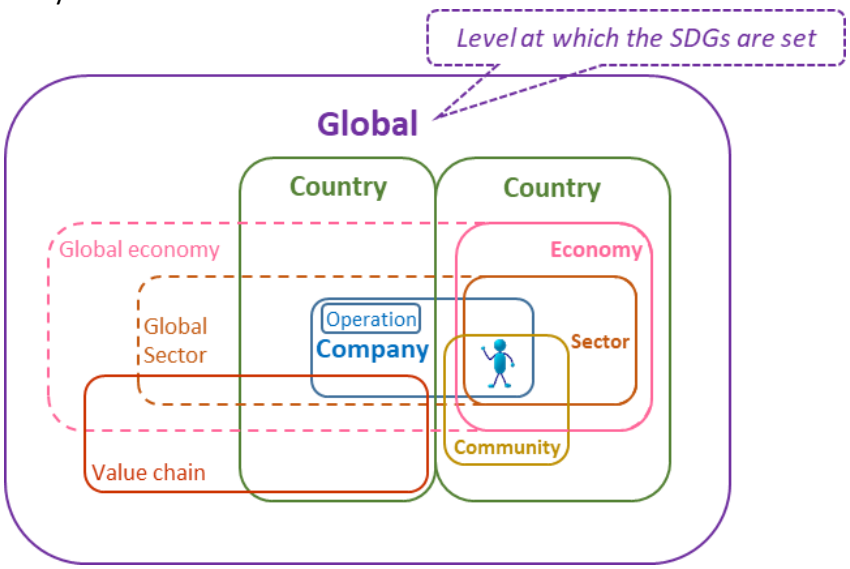
Example: Delineating the system of interest – A case study in vehicle engineering

For his dissertation research Ian Ellison, MSt SL (Cohort 1), takes the perspective of an engineer working within a formal product creation system in in an automotive manufacturer. The drivers and tools that impact their work towards engineering for sustainable, personal mobility are then examined. By tracing engineering responses back to root causes, the study identifies a series of potential risks to the achievement of whole-system sustainability goals. Based on the findings, it argued that the only way to deliver a fully sustainable outcome for personal mobility is to adopt a more holistic, systems perspective.

2. Misconception (partial): Systems change needs to be at a global level.

The overall ambition is, of course, to achieve change at global level, which is the level at which the *Sustainable Development Goals* (SDGs) are set. However, there are few, if any, actors that have agency at the global level. Large systems need to be changed by multiple actors *within* the 'sub-systems' that make up a global system by acting in tandem with (or instead of) the 'rule makers' that have greater ability to influence large systems.

The diagram below illustrates how from the perspective of a decision maker within a company, there are a variety of systems that they could aim to influence; however, the larger the system, the less their influence is likely to be.



Further work is needed to determine the optimum balance between 'bottom up' versus 'top down' change driven by policymakers and global institutions. Nevertheless, the cumulative impact of many companies acting for positive change should not be underestimated.

Example: Cumulative impact of action by many businesses – Paying living wages

CISL's Case for Living Wages report highlights the benefits that can accrue to society and businesses if living wagers are paid. When scaled, this company-level intervention can have far-reaching positive impacts on workers directly and via the ripple/multiplier effect caused by their improved wellbeing and economic status. By 2022 10,000 UK businesses were voluntarily paying the living wage, including half of the FTSE 100 companies. Nevertheless, considerable potential for further scaling since in the UK there are 44,000 medium and large businesses, and around 17% of workers are still paid below the living wage.

3. Misconception: Systems thinking should replace reductionist approaches when analysing sustainability challenges.

Systems thinking is often presented as being a necessary reaction to the shortcomings of linear or reductionist thinking. Developing the elephant analogy, once again – Desmond Tutu is reported to have said that: "There is only one way to eat an elephant: a bite at a time", so a holistic approach is not necessarily suitable for practical action. This apparent contradiction can be reconciled by recognising that holism and reductionism can be complementarity.

In summary, system thinking is appropriate for framing and understanding an issue (informed by an understanding of the parts); whereas reductionist approaches can be useful for more detailed analysis and action (informed by a holistic understanding). The is the terrain explored by the research outlined briefly in the vehicle engineering example, above.

Example: The need for 'big picture' and detailed analysis – Urban planning

The development of a master plan is promoted for effective urban planning. This is a "dynamic long-term planning document that provides a conceptual layout to guide future growth and development." (Systems approaches are not always used for such planning, but its value for this purpose has long been recognised.) However, it would not be sensible to construct the infrastructure and buildings only with reference to the master plan – detailed design and analysis using the classical engineering approach of breaking the system down into its constituent parts is needed. Nevertheless, it is inappropriate for master planners to view a city as being comprised of 'LEGO® blocks' of engineered components, although there are undoubtedly examples where this has been the case. An interdisciplinary master planning team should include input from engineers familiar with the detailed design and analysis (to ensure that the plan is practically implementable) alongside others who are able to look at interrelationships at an urban scale.

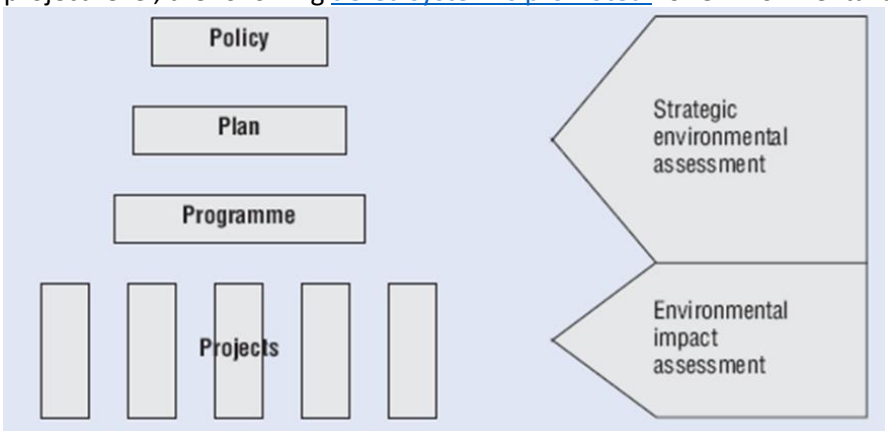
4. Misconception: All system-level sustainability challenges are complex or 'wicked'.

It has become *de rigueur* to describe sustainability problems as complex (adaptive) systems or 'wicked' problems. However, the degree of complexity depends on the context, scale and/or level at which the problem is being addressed. For example, solving climate change globally is a *complex* or, even, a 'wicked' problem; however, once there are agreed national and sectoral targets, then from the perspective of a company needing to respond, it may be 'only' *complicated*. Once the company has set objectives, then from the perspective of a factory manager needing to switch to renewable energy it could be *simple* (in a 'systems' sense – not necessarily technically or financially straightforward).

Complexity should, of course, not be underestimated, but it can be the cause of inaction when it is overstated, due the sense of lack of understanding and/or agency that this may cause.

Example: Hierarchical allocation of complexity – Environmental assessment

To ensure that complex issues are resolved at higher planning levels and to simply matters at the project-level, the following tiered system is promoted for environmental assessments:



Despite its theoretical appeal, it is criticised for being an unrealistic representation of reality. This is largely because authorities at higher levels seldom have the capacity and/or inclination to provide the required clarity, or the timing with which it is delivered is misaligned with project proposals.

5. Misconception (partial): Intervention must be at a 'deep' systems level

Various efforts to describe the characteristics of systems develop the notion that they are not purely physical structures. Iceberg analogies are used to distinguish between the 'shallow' or visible characteristics versus the 'deep' or implicit characteristics. The common assertion is that intervening at a 'deeper' level can reach causal factors and achieve more lasting and transformative change. Assertions such as this risks conflating and setting in opposition two different and equally important things, namely the 'deep' motivation to act (as influenced by paradigms/mental models) versus how to act in a practical and visible manner once motivated to do so. The former is of little use without the latter; hence it is counterproductive to diminish tangible interventions by designating them as 'shallow'. Of course, without the necessary motivation, the resulting interventions are likely to be shallow; hence, once deeply motivated leaders also need to be equipped to act 'deeply' (and visibly).

Example: The need for both good intentions and practical actions – Patagonia

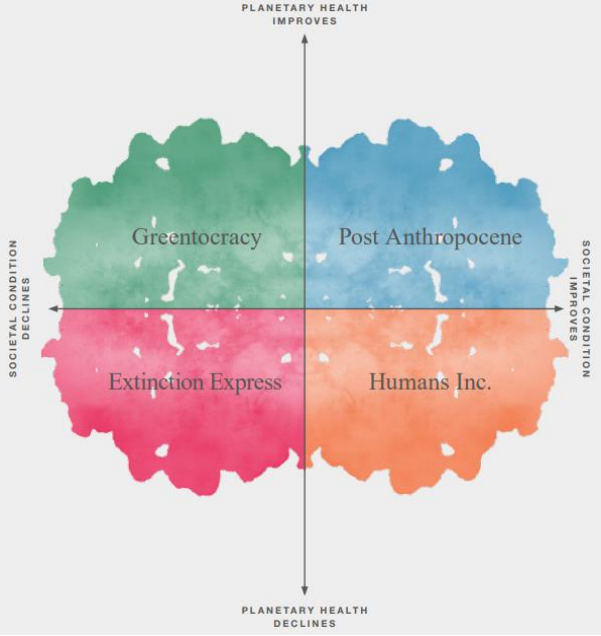
Patagonia is (too) frequently held up as an example of a purpose-led organisation that has flowed from the deeply held values of the founder. This lofty status would be eroded rapidly if it the company did not 'walk the talk' by striving for leading operational and product performance. Visible interventions include being an early adopter of 100% cotton, using a high proportion of materials made from recycled fabrics, and creating longer-lasting products. Of course, critics point out that that the face many of the same challenges as other garment manufactures and that there is room for further performance improvements. Arguably, their iconic status is sustained by the combination of the motivation to act and actually doing so, at least to a greater extent than most of their competitors.

6. Misconception (partial): System thinking is all about systems maps

As 'systems thinking' has gained traction as a valuable approach to understanding complex problems, it can – at times – appear to be primarily about producing systems maps. However, there are a variety of other tools and approaches that are useful for supporting decisions in the face of complexity/uncertainty and/or at scale; thereby informing our understanding of systems. For example, scenario development can be useful when formulation long-term plans in the face of uncertainty.

Example: Scenario development to support longer-term planning – Arup 2050 Scenarios

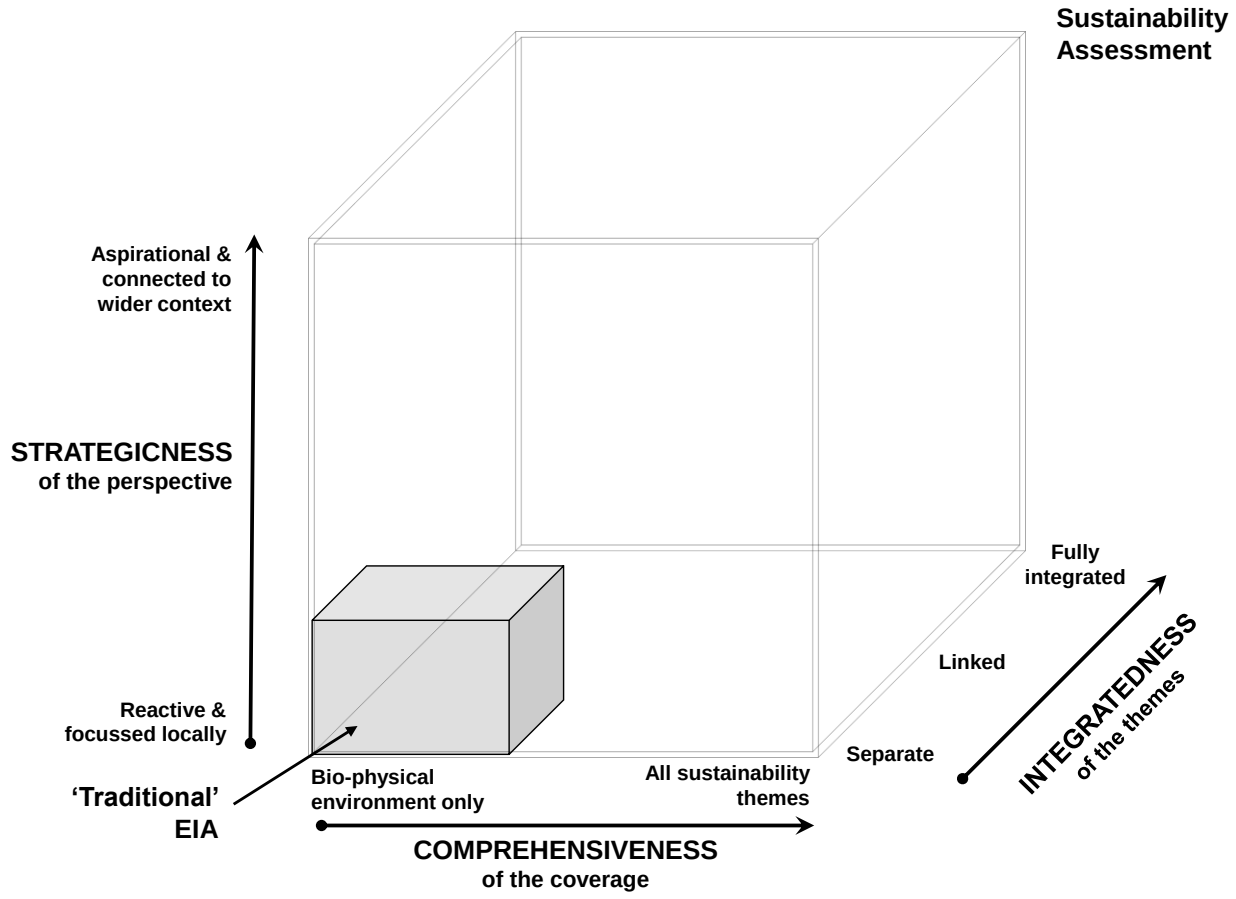
Arup have developed four 2050 scenarios of plausible in futures. Scenarios are stories that describe what the future could look like. They are developed in response to the recognition that the future is unpredictable; hence no single future can be envisioned with confidence. They are used to inform options that are more likely to achieve desirable sustainability outcomes. The Director of the Arup Foresight team explains that: "We are doing so to gain a deeper understanding and appreciation of the implications, opportunities and threats to, and on, our businesses and markets."



Tools have also evolved for use in specific contexts. For example, *Strategic Environmental Assessment* (SEA) is promoted as means to systematically evaluate the environmental (and social) implications of a proposed policy, plan or programme. SEA evolved in response to the frequently reactive nature of *Social and Environmental Impact Assessments* (S&EIAs) of capital projects, which led to the desire to shift decision-making 'upstream' to more strategic levels.

Example: Sustainability Assessment to support decision-making for capital projects

'Sustainability Assessment' (SA) is an emergent field where various efforts are beginning made to develop new tools or to improve existing ones to improve their ability to direct decision-making towards sustainability. The diagram below summarises an attempt to identify the distinguishing features of SA for application to capital projects. It was developed by distilling common themes described in literature and analysing best practice case studies. It is acknowledged that process and context features are important; however it was concluded that they are not *distinguishing* features of SA compared to established forms of assessment, such as Environmental Impacts Assessment (EIA).

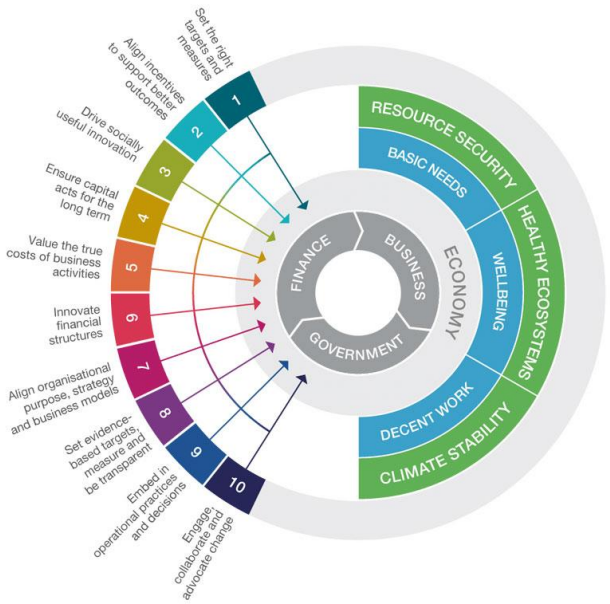


Hacking T. 2019. The SDGs and the sustainability assessment of private-sector projects: theoretical conceptualisation and comparison with current practice using the case study of the Asian Development Bank, *Impact Assessment and Project Appraisal*, 37(1), pp.2-16.

7. Misconception (partial): Leverage points are needed to change systems

To achieve system change, the need to identify leverage points has gained traction. These are places to intervene or 'points of power' where effort is significantly rewarded. While identifying such points is desirable, it is not sufficient. It is also necessary to identify 'levers', namely the specific interventions/actions/measures by which control, or influence can be applied to a leverage point(s) in order to realise the desired system changes. Adapting an old analogy – levers are the 'hammers' and leverage points are the 'nails'.

Example: Levers and Leverage Points: CISL's Rewiring the Economy



CISL's Rewiring the Economy RtE) presents the interdependent **tasks** to be delivered by leaders in business, government and finance in order to "drive up positive impacts like decent jobs and drive down negative impacts like inequality, waste and resource scarcity – in short which deliver the SDGs" It is explained that the aim is to: "find and exploit the key **leverage points** for positive change – those places where relatively modest effort could produce a new paradigm".

A pathway is also needed – this is the timing or scheduling of the interventions from the present into the future. ('Pathway' is sometimes used to refer to all aspect of the intervention, including the temporal dimension.)

Example: Future pathways – South Africa post COVID-19

For her dissertation research Melanie Janse van Vuuren, MSt SL (Cohort 10), used systems thinking to explore how the impact of COVID-19 shifted paradigms to enable transformational future pathways for South Africa. The research was qualitative with data collected via interviews and then used in combination with published data on COVID-19 from academia, business and government. The findings reveal that COVID-19 caused already noticeable paradigm shifts in the economic, social, environmental and governance/political dimensions; however, the impact of these shifts may manifest within varying timescales, causing parallel pathways. This is due to 'postnormal' potential of COVID-19 and the resistance towards the speed of change represented within each dimension. The research concludes with describing three parallel future pathways based on the interviewee responses and secondary data.

In summary, to achieve change, it is necerssy to define: What? (the system), Where? (leverage points), How? (levers), and When? (the pathway).

CISL's *Rewiring the Economy* promotes "change at the level of whole systems" and argues for this to be transformational and not merely focused on succeeding within current economic and social systems. Systems change also underpins CISL's impact leadership model and features prominently in CISL's education programmes, including the Master of Studies in Sustainability Leadership (MSt SL) where it is a crosscutting theme. In the sustainability field, the need for systemic or system(s) thinking/change/ transformation is also

promoted by many other organisations and commentators including Forum for the Future, WBCSD, and the Stockholm Resilience Centre. Improved rigour and clarity will help to realise the full potential of systems thinking as an effective tool for informing decisions relating to sustainability interventions; thereby enabling its use in practice to mirror the enthusiasm with which it is use has been promoted.

This Primer was authored by Dr Theo Hacking, Director of the Graduate Programmes & Research Strategy at CISL.

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