WORKING PAPER

A Conceptual Framework for Transitioning to an Authentic Sustainable World

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Abstract

Our civilisation is unsustainable and it is getting worse fast. The human ecological footprint has already overshot the sustainable carrying capacity of the Earth, whilst population and economic growth are rapidly expanding our impact. We harvest renewable resources faster than they regenerate, we create waste and pollution faster than ecosystems can break them down into harmless substances. Technological solutions promoting eco-efficiency and sustainable industries, whilst necessary, are not sufficient. Change and transformation are urgently needed throughout society.

In this article, using the ESIMOP / PROMISE framework of Roberto Rigobon[2] and systems thinking concepts, we propose a dynamic systems perspective, to raise questions about the processes of change that are required, on multiple scales.

Based on this way of thinking, the example of COVID-19 episode highlights more than ever the critical need to find a clever equilibrium between human activity (in its several forms) and the Earth's ability to cope, giving due consideration to the resulting general implications.

JEL Classification: L21, O15, O32, Q21, Q51, Q56.

Keywords: Sustainability; Paradigm; Complex Systems; Feedback; Non-linearity; Carrying Capacity; Overconsumption; Externalities; Game-Changing Organisations.

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[2] ESIMOP = Environment, Social and political, Institutions, Markets and economy, Organisations, and Personal (or PROMISE written in other way, standing for Personal/Relational, Organisational, Market, Institutional, Social, Environmental).

Introduction

Is the COVID-19 pandemic a singular, once-in-a-lifetime event, or part of a broader set of megatrends that are shaping the future of our planet and society?

The coronavirus conjuncture directly questions the nature of the economic recovery and, indirectly, the state of the post-crisis world and its inevitable reconfiguration, calling on governments to ask themselves a certain number of structural questions aimed at transforming the general system in which we are evolving for more resilience in the face of future potential disruptions capable of destabilising the global equilibrium.

The shape of Economic recovery in V, U, or L… Financial crisis, political recession, real classic recession…

Beyond this quasi-universal taxonomy and subsequent scenarios recalling Albert Einstein's reflections on his vision of the world [1], a reality remains where the coronavirus marks with a red thread the starting point of the 4th paradigm of science, according to Jim Gray [2], embellished with a return to the fundamentals, where the position of the human being in his environment becomes central. A radical change in humanity and her relationship with what surrounds her will inevitably be observed and will require new, balanced, tailor-made and robust responses highlighting the famous maxim of Arthur Schopenhauer, acquired by Albert Einstein that, "a man can do as he will, but not will as he will".

As such, the SARS-CoV-2 emphasised, in light of Garret Hardin's 'Tragedy of the Commons' [3], the importance of truly mitigating against damage to the environment and granting a real role for sustainable development beyond the classic three-pillar balance diagram, first portrayed in 1987 in the Brundtland report of the World Commission on Environment and Development of the United Nations.

More generally, there were a handful of crises and trends that were already affecting our environment well before the SARS-CoV-2 started to spread. It is also essential that we understand the major forces shaping our world and how they interact, knowing that, according to Johan Giesecke writing in the Lancet medical journal: "Everyone will be exposed to severe acute respiratory syndrome coronavirus 2, and most people will become infected".

In other words, Michael Osterholm, Director of the Centre for Infectious Disease Research and Policy at the University of Minnesota, says that, "without a vaccine, which is likely more than a year away at best, the virus will continue

to spread until it is halted by herd immunity, estimating that would not kick in until 60-70% of the US population has been infected".

In this context, this paper comes is comprised of four parts:

- The **first part** is intended to highlight the power of provocative questioning [4] as a prerequisite for the precise identification of the problem to be treated and an antechamber of the solutions sought, according to the words of Peter Drucker [4]: "The important and difficult job is never to find the right answer, it is to find the right question". This part shows, therefore, the **power of questioning** in order to, as a first step, accurately define the deep nature of the problem to which we are subject instead of, as usual, directly looking for solutions from the outset that might only be symptomatic ones, whilst we look for fundamental solutions.
- The **second part** is devoted to the characteristics of complex systems which cut across all systemic thinking linked to sustainable development, according to the ESIMOP (or PROMISE written backwards) framework by Roberto Rigobon[3]. Note that the Rigobon ESIMOP model of sustainability, instead of framing the sustainability challenge as a conflict in which the economy, society and the environment fight for primacy, remains intrinsically innovative because it considers the economic, social and environmental elements as a whole, as a complete SYSTEM in order to really model the complexity of the relations linking the three aforementioned parts (Economy, Society and Environment), hence the systems model is presented in this paper.
- The **third part** establishes a systems model, linking growth, technological development and the carrying capacity of the Earth, that is able to measure the full extent of the sustainable development concept, which is certainly not limited to a simple compromise between economic, environmental and societal aspects, as defined by the classic sustainability model of Brundtland that is widely used throughout the World. This part, developing scenarios based on the proposed systems model, is intended to present future states linked to the way of handling various fundamental variables, modelling the relationships between the growth in human activity and the regenerative capacity of the planet.
- Based on the analysis and results coming from the third part, the **last section** of the paper could alert policy makers to rebuild a post COVID-

[3] ESIMOP = Environment, Social and political, Institutions, Markets and economy, Organisations, and Personal (or PROMISE written in reverse, standing for Personal/Relational, Organisational, Market, Institutional, Social, Environmental). *Ibid*.

Rigobon R. Macroeconomics and Sustainability in *Strategies for Sustainable Business*, MIT Sloan School of Management, 2014.

19 economic system, respectful of human beings and the environment in which they live. A number of principles, guidelines and recommendations are revealed.

1 The Power of Questioning

Do people who are great questioners naturally gravitate towards psychology - or does studying the workings of the mind help a person become a better questioner? One way or the other, we are consistently impressed by the challenging of received wisdom that goes on in that field. One example is from Scott Barry Kaufman who reports on a paper by Sean Murphy and Brock Bastian of the University of Melbourne [5] and starts his post with: "What does it take to live a meaningful life?

"In trying to answer this question, most researchers focus on the *valence* of the life experience: is it positive or negative?" he asks. Then he shares Murphy and Bastian's fresh finding, saying that people work hardest to make sense of the experiences in their lives that *produce intense emotions*, both positive and negative. In fact, meaning in life comes more from "peak emotional experiences" than from living a life of overall contentment and composure.

This sounds like all the more reason to make real efforts to get outside the comfort zone. Consequently, you may be asking a question yourself: What good does it do to recognise the power of catalytic questions if you don't know how to arrive at them? The answer is, you cannot summon catalytic questions with the snap of your fingers, but you can establish the conditions in which they will reliably arise.

In this framework, applying the principle of provocative questioning to sustainability can help policy makers define a new resilient development model that is able to positively interact with any great future crisis and overcome its negative externalities by simultaneously considering the different pillars of the ESIMOP model.

1.1 Natural Systems

By taking into account the essay of Daly [6] on the principles of ecological economics, we can list the necessary conditions for sustainability, based on the figure [1]:

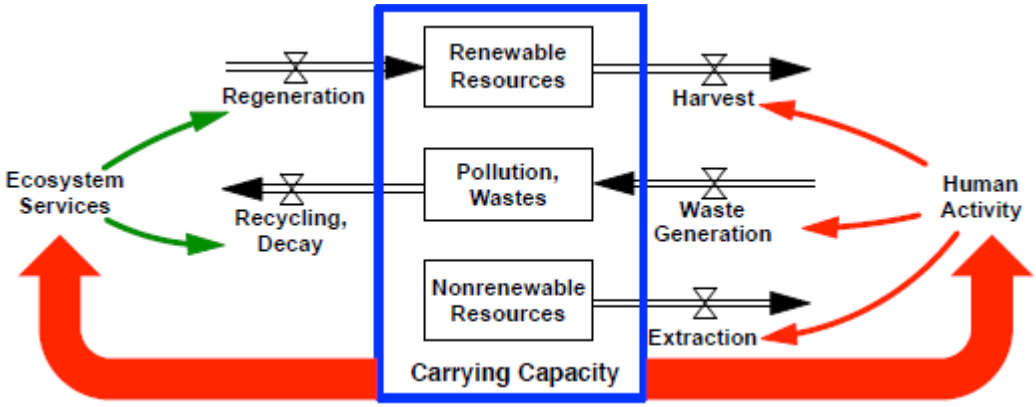

Figure 1: Necessary Conditions for Sustainability (Source: Daly H (1990))

- Renewable resources can be used no faster than they regenerate.
- Pollution and waste can be emitted no faster than natural systems can absorb them recycle them or render them harmless.
- Non-renewable resources cannot in long run be used at all.

Therefore, some catalytic questions can help policy makers to fundamentally redefine the relationship with the environment, such as:

- Where are we harvesting renewable resources faster than they regenerate?
    - How can we be more efficient in our use of those resources?
    - How can we help restore or accelerate the regeneration rate?
- Where are we polluting faster than the environment can safely absorb?
    - How can we reduce our pollution?
    - How can we increase the capacity of natural systems to absorb it?
- Where are we dependent on non-renewable resources?
    - How can we become more efficient in our use of these resources to buy us time?
    - How can we substitute renewable resources?

1.2 Social and Human Capital

In the same vein, we can ask:

- What is the distribution of health in the societies where we operate? What direction is it going? What implications does this pattern have for demand on products?
- What is the pool of human capital from which we are drawing our workers? How well are their basic health and educational needs being served?

1.3 Markets and Institutions

Markets and institutions are the core of any business model. If we look for a radical transformation of those models to demonstrate their sustainability, a deep questioning is needed:

- Where are there positive externalities of our sustainability efforts that are not currently being rewarded? How might we help create new institutions to reward us?
- Where are there negative externalities of our business or our competitors' businesses that are not being sanctioned? How might we help create appropriately regulated, improved institutions?
- In what ways do we contribute to the rule of law? In what ways do we undermine it? Are there patterns of malfunction in our extended value chain?
- How might we contribute to the development of basic human services that would ensure a better pool of workers, customers, suppliers and investors?

1.4 Stakeholders

Markets and institutions cannot effectively run without stakeholders working hand in hand and deploying actions that are well-coordinated and capable of generating real added value. For accomplished efficiency, policy makers have to offer all the requirements and respond to the major needs of employees, customers, suppliers, investors and communities. Some questions, therefore, need to find robust answers at every level of organisation.

- *Employees*
  - Are we making use of high-performance working systems?
  - Where might we get better productivity by creating better jobs?
- *Customers*
  - Are we serving the long term interests of our customers and resonating with their values to build brand loyalty and word of mouth?
- *Suppliers*
  - Are we enabling our suppliers to have a sustainable livelihood and ensuring reliably supply?
  - Are we supporting the continuous improvement of suppliers in sustainability?
- *Investors*
  - Are we building an enterprise that is financially viable in the long term?

- Are we accessing the full array of investors who might value the pro-sustainability aspects of our business? How might we make ourselves more transparent and visible?

- *Communities*
  - Are we helping sustain other organisations and businesses in our community to ensure our licence to operate and access to human capital?

1.5 Accounts and Budgets

Finance and the subsequent corporate social responsibility are two other corners of the ESIMOP model we have to deal with and to deeply understand, in order to be able to propose sustainable solutions.

- Are we fully accounting for the life cycle costs of our resource-intensive purchases and capital investments?
- Are we fully assessing the risks of unsustainability in our company and value chain?
- Are we fully accounting for the benefits of sustainability-related investments?
- Are we appropriately investing in new business opportunities arising from market demand for sustainability?

1.6 Personal

At the individual level, we need to commit to the principles of sustainability.

- Am I "walking the talk" in my personal and professional life?
  - What is my personal ecological footprint? How might I improve it?
  - Am I contributing to the flourishing of others in my community to the best of my ability?
- Am I maintaining my physical and psychological health, as well as my professional objectives?
- Am I maintaining integrity with my personal commitments to friends, family, neighbours and community, as well as professional associates?

All in all, figure [2] tends to summarise the hallmarks of the PROMISE/ESIMOP model [7], which develops an holistic appreciation of the intricate interconnections binding us to one another and to nature, thanks to the exploitation of systems thinking principles [8] [9] [10].

Figure 2: The New Embedded Sustainable Model (Source: Jay[4])

"The economy, society and environment are, in fact, not separate domains to be traded off against one another, such as in the Brundtland report. The economy is embedded in a social and political context which, in turn, is embedded in ecosystems upon which all life depends. The interests of business, society and the environment are, therefore, fundamentally aligned. We cannot have healthy firms, a healthy economy and healthy people if growth and the pursuit of profit destroys the environment. Neither can we have a healthy environment if people live in poverty, are ill-fed, without decent housing, healthcare, education or economic opportunity" [11].

Creating an effective science of sustainability and building the public understanding required for action requires the development of skills that are capable of recognising the boundaries of the mental models used by people and then expanding them, so that individuals become aware of, and take responsibility for, the feedbacks created by their decisions.

[4] Jay J. PROMISE (ESIMOP): A Systems Approach to Sustainability Strategy. MIT Sloan School of Management. Feb. 2015.

Consequently, based on the systems-thinking principles behind the PROMISE framework, the challenge lies in moving to specific tools and processes that help us understand complexity, design better policies, facilitate individual and organisational learning and catalyse the technical, economic, social, political and personal changes we need to create a resilient and sustainable society.

For example, the impact of SARS-CoV-2 can, thus, be more easily qualified by using the PROMISE framework as a systemic model highlighting the dependency relationships between its different dimensions. The implications of shutdown, for short and eventually longer terms, generate unemployment, a change in the nature of work and an increased tendency towards deregulation, in order to try to absorb the pandemic shock. Therefore, figure [3] clearly illustrates the effects of the coronavirus that are positive with regards to certain dimensions and negative with respect to others. In this sense, we need to accurately imagine and deeply understand the direct, indirect and non-linear relations between different dimensions, in order to unravel the inherent complexity of the problem being dealt with and, ultimately, to find truly balanced solutions.

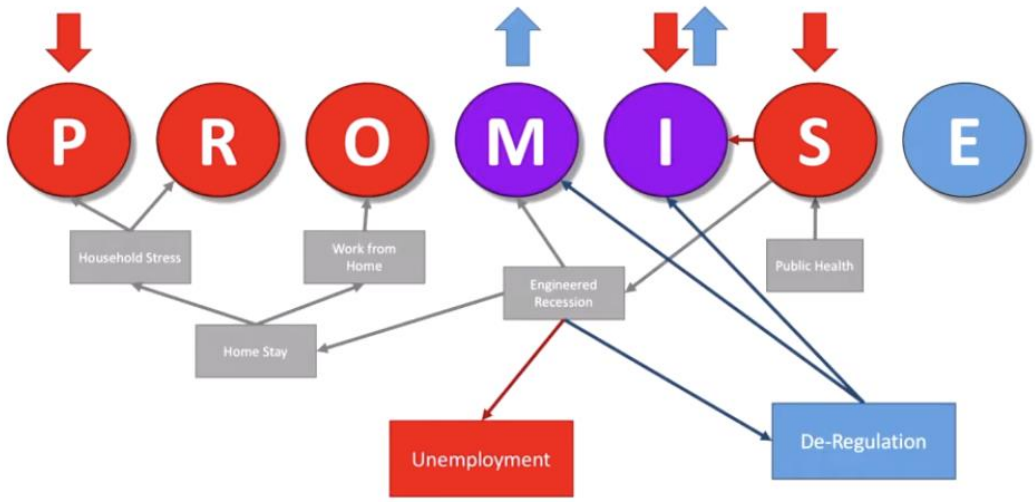

Figure 3: The SARS-CoV-2 Effects (Source: Rigobon[5])

[5] http://web.mit.edu/rigobon/www/Videos/promise.html

2 Characteristics of Complex Systems

2.1 Policy Resistance

"Thoughtful leaders throughout society increasingly suspect that the policies we implement to address difficult challenges have not only failed to solve the persistent problems we face but are, in fact, causing them. All too often, well-intentioned programs create unanticipated "side effects." The result is *policy resistance*, the tendency for an intervention to be defeated by the system's response to the intervention itself. Policy resistance arises from a narrow, reductionist worldview. Consider the "unanticipated events" and "side effects" so often invoked to explain policy failure. Political leaders blame recession on corporate fraud or terrorism. Managers blame bankruptcy on events outside their organisations and (they want us to believe) outside their control. But there are no side effects - just *effects*. Those we expected or that prove beneficial, we call the main effects and claim credit. Those that undercut our policies and cause harm, we claim to be side effects, hoping to excuse the failure of our intervention. "Side effects" are not a feature of reality, but a sign that the boundaries of our mental models are too narrow, our time horizons too short" [11].

2.2 Feedback, Non-linearity, Eroding Goals and Time Delays

Contrary to the open-loop mental model largely spread and utilised, the world reacts to our actions with some delays, by altering the environment and the decisions we make (figure [4]). The anthropogenic actions may trigger so-called side effects that we did not anticipate. Other agents, seeking to achieve their goals, act to restore the balance we have modified, also generating intended and unintended consequences.

Therefore, policy resistance arises when we fail to account for the so-called side effects of our actions, the responses of other agents in the system, the ways in which experience shapes our goals and the time delays often present in the feedbacks.

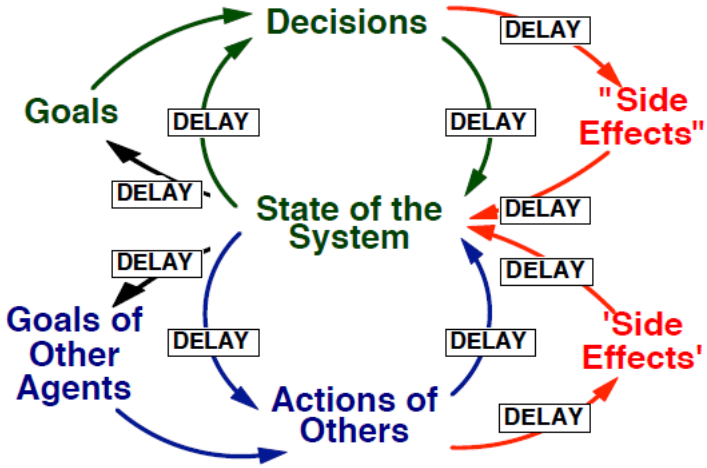

Figure 4: Sources of Policy Resistance (Source: Sterman[6])

Furthermore, the interactions amongst the feedbacks in complex systems are typically non-linear; each variable influences others, directly or indirectly, through balancing, reinforcing loops and some non-linear relationships. These same endogenous variables are also influenced by some other exogenous and/or endogenous parameters.

Other phenomena enhanced by the non-linearity of the systems are felt after a certain number of cycles (loops) that are capable of reducing the carrying capacity of some stocks, reaching, therefore, the critical tipping points leading to the depletion of resources and highlighting the *tragedy of the commons* [3] [12], in which over-exploitation is the outcome of rational decision making, because the benefits of taking more accrue, whilst the costs are borne by all.

The carrying capacity that would be altered by human activity can be relative to land, soil fertility, material resources, energy resources, clean water, clean air, waste absorption capacity, biodiversity…

Consequently, eroding goals are particularly common in sustainability contexts, due to an imperfect understanding of ecosystem dynamics. Estimates of "normal" stocks and maximum sustainable yield are uncertain because of limited information, natural variability and relative knowledge of population dynamics.

Besides, time delays in complex systems are common and particularly troublesome. In this framework, the trade-off between short and long term

[6] Sterman JD. State of the World: Ecological and Economic Sustainability. MIT Sloan School of Management. 2014.

actions is particularly problematic in the domain of sustainability because of the inertia effect (long time delays) in ecological and economic processes.

3 A Systems Model and Different Futures

Integrating feedback, time delays and stock-flow structures yields a simple, conceptual framework to identify the key leverage points for the creation of a sustainable world, particularly after major crises such as the sanitation one arising from the SARS-CoV-2 2019 pandemic.

Figure [5] shows a simplified model [13] integrating growth of human activity with the carrying capacity of the planet.

For instance, on the left, human activity grows through the reinforcing feedbacks of population and economic growth (reinforcing loop R1). If the environment were unlimited, growth could continue indefinitely. However, growth in human activity is constrained by the adequacy of resources (the ensemble of non-renewable resources, renewable resources, pollution and waste shown in figure [1]). As populations and economic activity grow, indeed relative to carrying capacity, the adequacy of resources declines. Sufficient decline in resource adequacy lowers the net fractional growth rate in human activity, eventually causing growth to stop via “Involuntary Limits to Growth” (balancing loop B1). It should be emphasised here that the system involving the loops B1 and R1, as well as the link between the variables “Adequacy of Resources” and “Carrying Capacity”, is representative of a naïve, simplistic Malthusian logic because the planet’s carrying capacity remains a dynamic factor that should be correctly modelled.

Indeed, figure [5], taking into account in its completeness of the dynamic aspect of the different systemic variables considered, combines several processes that allow us to grasp the appropriate way to generate an authentically sustainable world in the long term.

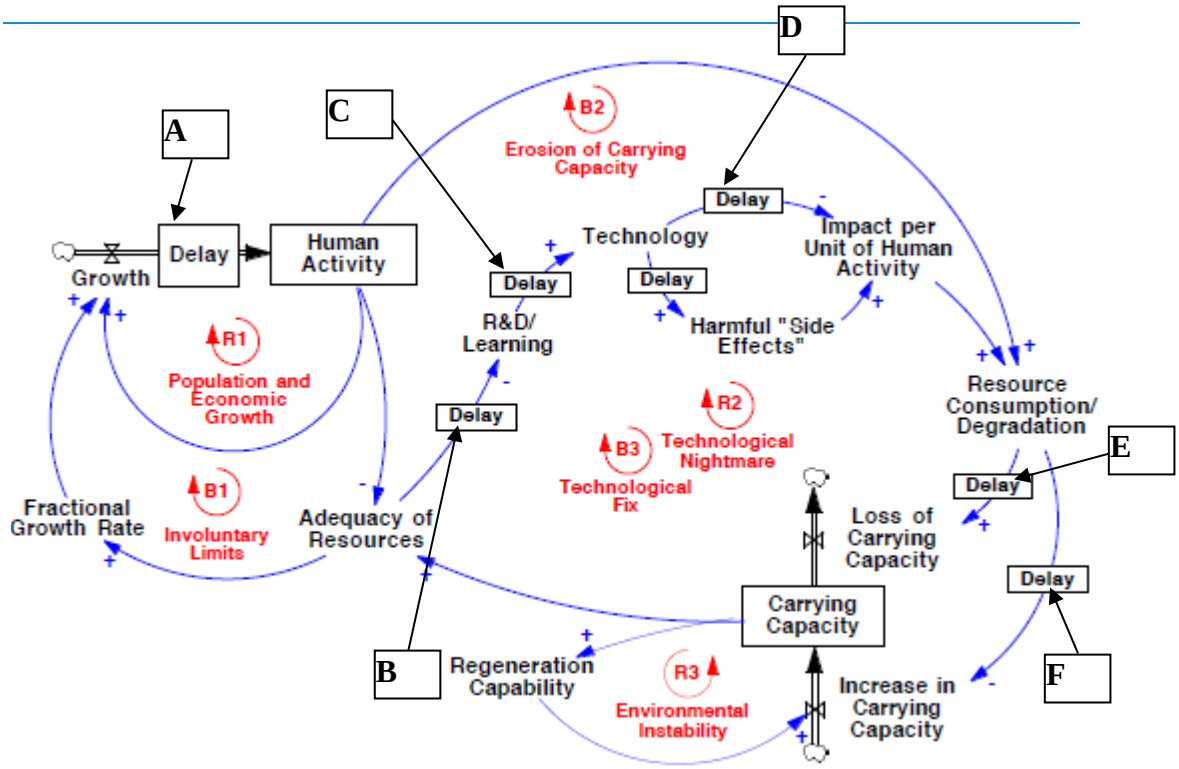

Figure 5: Integrating Growth, Carrying Capacity and Technology (Source: Sterman[7])

3.1 The Impact of Delays

The nature of the different delays indicated in figure [5] is as follows:

- Delay A:
  - Due to population age structure;
  - Slow adjustment of norms for family size and income aspirations;
  - Slow change in infrastructure and settlement patterns, etc.

- Delay B :
  - Delays in perceiving environmental problems, building scientific consensus, political will, passing legislation;
  - Delays in reaction of markets due to corporate opposition, inertia time needed to reallocate resources and build research infrastructure;
  - Delays lengthened by opposition of entrenched corporate and political interests (e.g. CAFE - Corporate Average Fuel Economy - standards, CFCs - Chlorofluorocarbons - regulation, climate change).

[7] Sterman JD. *Ibid.*

- Delay C :
  - Delay in creating and testing technologies: Building research resources, knowledge base; developing ideas, testing and evaluation, commercialisation and scale up, field testing, learning by doing, side effect evaluation and defect correction.

- Delay D :
  - Diffusion and deployment delays caused by long lifetimes of existing structures, infrastructure, plant and equipment
    - ✓ Increased by organisational inertia, lock into existing infrastructure, complementary assets, income inequality, intellectual property laws, local resistance to globalisation.

- Delays E and F :
  - Due to physical processes in environment
    - ✓ Examples: Ozone Depletion, Chlorinated Hydrocarbons accumulating up food chain, Global Warming.

3.2 Technological Side Effects and Collapse of Carrying Capacity

Technology is not always helpful or benign. Designed to solve one problem, it often creates others, such in the cases of DDT (Dichlorodiphenyltrichloroethane), nuclear power, dams, automobiles and many others. The Precautionary Principle can reduce the risk of harmful side effects from new technologies, but it entails long *delays* (essentially delays B, C, D and E) in the evaluation of new technologies and slow, gradual diffusion, weakening the technological fix feedback (balancing loop B3 on figure [5]). Consequently, shortening the delays in the technological fix feedback to avoid limits to growth, increases the odds of harmful side effects.

Through the "Environmental Instability" reinforcing loop R3, loss of carrying capacity can compromise the ability of the environment to regenerate, leading to a vicious cycle that further erodes the carrying capacity. Massive CO_2 exhaust from transportation vectors, industrial pollution, albedo feedback and warming, desertification, disruption of ecological balance and ecosystem collapse are all concrete examples.

As is typical in complex systems, much of the debate between environmentalists and technological optimists focusses on the symptoms of the problem, whilst this exchange misses the core point about resource scarcity,

the potential environmental problems, the loss of the carrying capacity and the limits that can quickly be reached despite technological progress. As long as growth is the driving force, there can be no purely technological solution to the problem of scarcity unless people learn to consume frugally. Indeed, until we learn to end the quest for more, a healthy, prosperous and sustainable society cannot be created - no matter how smart our technology is.

Innovation simply lets us grow, until one or another limit to growth becomes constraining. In fact, we are not accustomed to asking "how much is enough", but according to Gandhi's vision of a world in which "there is enough for everyone's need but not for everyone's greed" and following the dynamics of complex systems, the COVID-19 sanitation crisis represents an authentic opportunity to change our habits and take our personal responsibility for each other and future generations.

3.3 Analysis and Discussion

Based on the concepts described above and the lessons from dynamic systems, some elaborations arising from the theoretical systems model (figure [5]) are defined, emphasising scenarios[8] outlining the different futures of the post-coronavirus era.

3.3.1 Scenario 1

If carrying capacity is constrained, or brittle, or if delays in response of human activity to resource adequacy are long, or if delays in response of markets and policy to resource adequacy are long, or if technological innovation causes harmful side effects, the results provided by the proposed modelling (figure [5]) will tend towards *overshoot and collapse* of the system, resulting in a decrease in human activity and economic downturn, as observed with the COVID-19 pandemic episode (figure [6]).

[8] Sterman JD. *Ibid*.

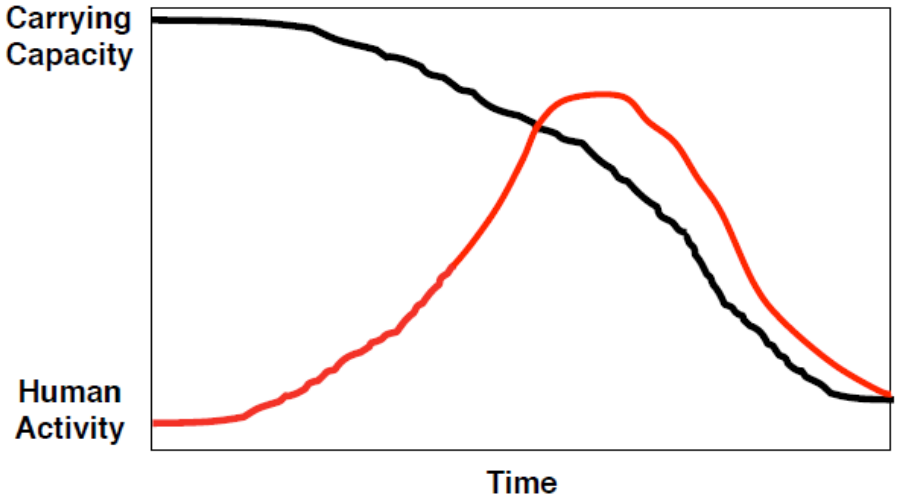

Figure 6: Human Activity X Carrying Capacity Scenario 1

3.3.2 Scenario 2

If delays in the response of human activity to resource adequacy are modest or delays in the response of markets and policy to resource adequacy are modest, or technological innovation causes few side effects, the results are as follows (figure [7]), remaining similar to the scenario 1. This observation, resulting from the comparison of the scenarios 1 and 2 outputs, shows that beyond a certain threshold, with an accumulation effect, the degree of human activity intensity has little importance, also tending towards collapse of the system because of a limited capacity to regenerate resources.

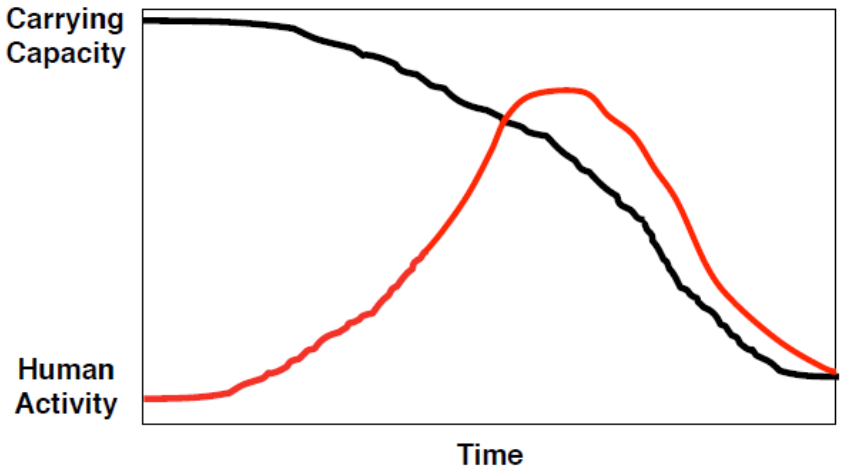

Figure 7: Human Activity X Carrying Capacity Scenario 2

3.3.3 Scenario 3

As specific resources become scarce or particular pollution problems become severe, according to the systems model (figure [5]), technological innovation will enable us to use substitutes or remediate the problem. Resource adequacy improves. The system continues to grow. Carrying capacity comes under additional stress. If these new problems are solved, then the system grows even further until, eventually, technology doesn't develop in time. The system still tends towards *overshoot and collapse* (figure [8]).

The case of the COVID-19 episode is symptomatic in this regard, with technology that could not keep up with the times (in particular the development of a vaccine, of ad hoc drugs), resulting in the compulsory confinement of populations and a global economic recession.

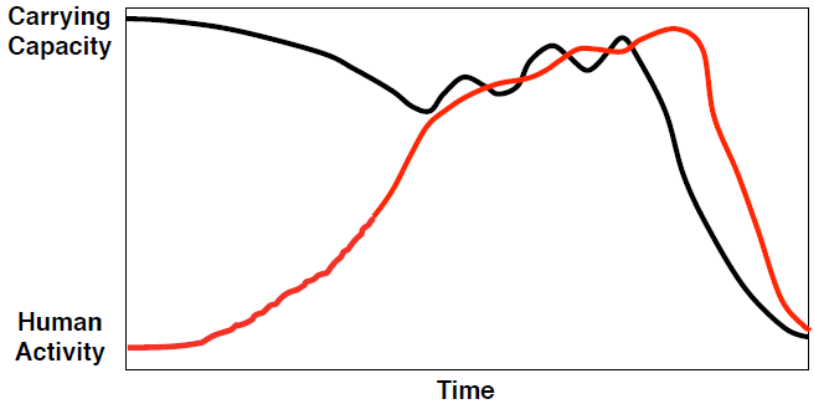

Figure 8: Human Activity X Carrying Capacity Scenario 3

3.3.4 Scenario 4

As long as the driving forces for growth remain, any improvement in the carrying capacity will result in more growth, until resource adequacy falls sufficiently to halt that growth involuntarily (figure [9]).

More than that, as long as the driving forces for growth remain, there is no real and continuous effort for looking for innovative technological solutions, as we have well observed in the case of COVID-19 pandemic, where we have particularly and unfortunately noted the dependency of many countries, amongst the most developed ones, on molecules coming from Asia, more particularly from China, outlining the weaknesses of the occident in terms of applied research and R&D.

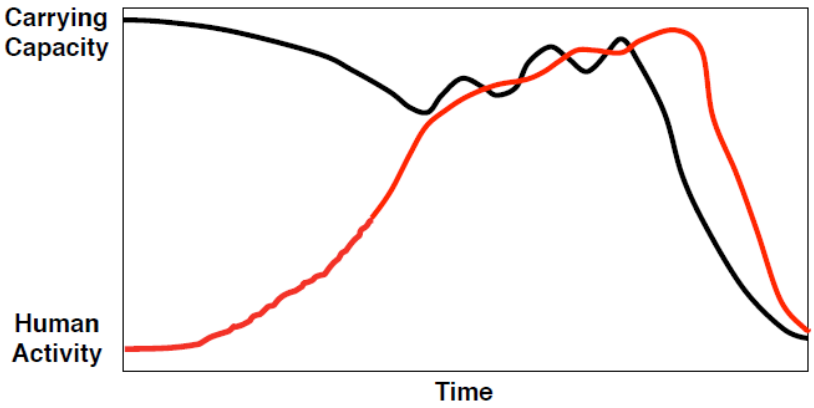

Figure 9: Human Activity X Carrying Capacity Scenario 4

Note that figures [8] and [9] respectively, representing scenarios 3 and 4, are identical in appearance. It is not, however, a redundancy, but a complex entanglement of inter-variable relationships leading to a given situation, according to distinct human actions and behaviours.

Indeed, the essential difference lies in the interpretation of these two scenarios in light of the systemic model of figure [5] involving, on the one hand, for the scenario 3, the balancing loop B3 (technological fix) and the reinforcing one R2 (technological nightmare) with the limiting condition represented by the variable "Regeneration Capability"- *recalling the principle of the archetype "Limits to Growth" (figure [10]) highlighted by Senge [14]* - and, on the other hand, for the scenario 4, the main balancing loop B2 (erosion of carrying capacity) - *taking into account the technology in an indirect way* - that has a certain ascendancy over the other loops, explaining the irreparable collapse of the system in which we evolve, if the intensity of human activity and the planet's carrying capacity are not symbiotic. Finally, scenario 3 emphasises the particular role of the technology, whilst scenario 4 is more general and deals with more variables, explaining the mechanism altering the earth's carrying capacity and conducting the economic collapse amongst other bad consequences.

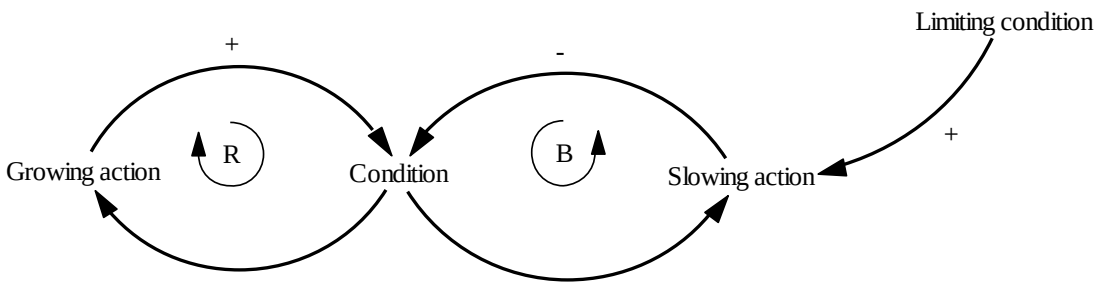

Figure 10: The Limits to Growth Archetype ([14])

"A process feeds on itself to produce a period of accelerating growth or expansion. Then, the growth begins to slow and eventually comes to a halt and may even reverse itself and begin an accelerating collapse. The growth phase is caused by a reinforcing feedback process. The slowing arises due to a balancing process, brought into play as a limit is approached. The limit can be a resource constraint, or an external or internal response to growth. The accelerating collapse arises from the reinforcing process operating in reverse, to generate more and more contraction. The management principle consists of removing or weakening the source of limitation" [14].

Consequently, the human activity growth has to be gradual and smooth, converging towards a stable equilibrium in order to preserve the planet carrying capacity, avoiding the traps of the *tragedy of the commons* and the economic decline that could be disastrous as depicted in figure [11]. Therefore, the proposed model through figure [5] helps us to understand the fundamental structure of the system in which we evolve and to pinpoint the critical variables that are able to fix the problem of sustainability. Regulation of growth intensity, monitoring of regeneration capability and simply the fact to gradually, but seriously stop the use of non-renewable resources, are the main factors to closely watch.

This new way to operate has to be scrupulously investigated by policy makers, in order to reinvent an authentic, sustainable world in the COVID-19 post-pandemic era favouring, instead of a standard all-out development, a **measured development** avoiding the opportunism of human beings and the negative consequences of the *tragedy of the commons*.

Focussing on internal structures and re-examining mental models in order to recognise longer-term patterns of change are, therefore, vital. This thinking transformation must, in particular, be prepared and operated as a priority within the economic fabric.

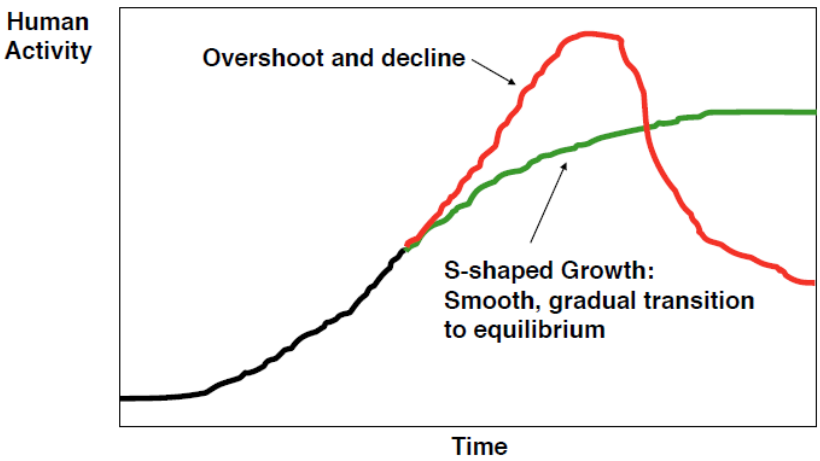

Figure 11: Possible Futures

4 General Implications

Following the figure [11] lessons, disruptions of all kinds, superimposed on the unbridled growth of human activities, have always had a heavy impact on our modes of operation due to the complex entanglement of economic ties, leading to substantial technological developments and an abrupt change in preferences, expectations and behaviours of individuals as citizens, employees and consumers.

These changes, developments and impacts on our way of living, of working and on our use of technology, are structuring and require a multi-criteria evaluation capable of proposing a new resilient economic model, ultimately respectful of natural systems, as evocated in the Rigobon ESIMOP / PROMISE framework.

As a result, different economic sectors are subject to more or less radical transformations to ultimately marry a model that is becoming innovative and inclusive.

Furthermore, at a tactical-operational level, entrepreneurial support remains essential, highlighting the role and skills of a truly transformational leadership.

Various *macroscopic* **factors** [15] available to decision-makers to define roadmaps of a new kind are then able to characterise an umbrella economic model, **authentically** focussed on universal values and principles, whilst being objective and performance orientated.

1. Distribution of wealth: Distribution of income, concentration of assets, capacity for social advancement and reduction of the differences between the various socio-professional categories.
2. Education: Universal access to education and renewed quality.
3. Infrastructure: Availability, accessibility, affordability and quality.
4. Government and transparent governance: Local, regional, national and international governing bodies, methods of election, communication and best practices of continuous sharing.
5. Geopolitics: Relations between governments of different countries.
6. Economy: Control of the usual macroeconomic and microeconomic factors, reinforcement of quasi eco-concepts such as *glocalism*.
7. Public health: Equality and affordability of care, efficient health systems.
8. Real environmental protection and sustained agricultural production: Preservation of non-renewable resources, circular economy, negative externalities (local air pollution, noise pollution, accidents, congestion,

oil dependence…), application of the principles highlighted by *the tragedy of the commons* ([12], [16], [17]).

9. Balanced development of emerging technologies profitable to humans, plural innovations (outside, inside and around the box), ethical uses and responsible transitions [18].

At the *mesoscopic* level, organisations, whatever their professional sector, must reinvent themselves internally and in their relationships with their employees, in order to be able to influence their direct, indirect and induced external environment.

It is only at this price that we will gradually witness, from the bottom up, the robust emergence of a genuinely sustainable and resilient world.

4.1 Towards Social Sustainability Within Firms

Whatever the kind of management, the majority of top managers try to consider capital as the most important operating parameter, even during off-crisis periods. This way of thinking remains unsustainable and could disengage and demotivate employees who are, in general, the least well treated. According to Ton and Harrow [19], it would be more valuable for organisations to observe a different order: first, the customer; second, the employee; third, the supplier; fourth, society; and fifth, capital.

Stability, good working conditions, training, transparency, compensation, quality of life and opportunities for advancement, compound the main factors for loyal employees who continually seek their company's success by being creative and proposing robust solutions.

In this framework, the **good job strategy**[9] **that could indirectly contribute to a robust, smooth and balanced global growth,** as depicted by the green curve in figure [11] has to break the classic vicious cycle, widely encountered, to operate within a virtuous one (figure [12]) by increasing labour budgets through investing in employees by:

1. Offering less products, just the most necessary ones by containing the superfluous, which will allow employees to focus on value-added operations;
2. Combining process standardisation with empowerment of employees;
3. Training and cross-training employees;
4. Operating with slack for more people, creativity and innovation generating a true surplus for organisations.

[9] Ton Z. The Good Jobs Strategy: How the Smartest Companies Invest in Employees to Lower Costs and Boost Profits. Boston/New York: Houghton Mifflin Harcourt Publishing Company, 2014.

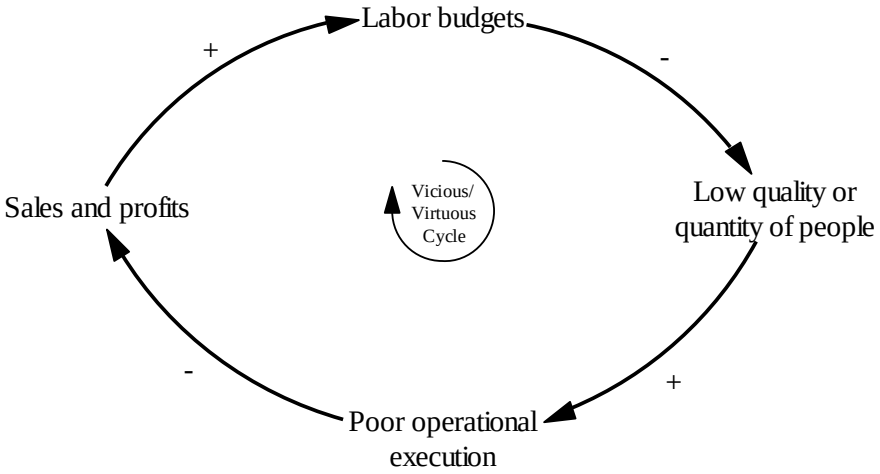

Figure 12: Vicious versus Virtuous Loop in Operations (adapted from [19])

4.2 Building Game-Changing Organisations

The impact of the COVID-19 pandemic and the observed recession that is hitting economies hard, are indubitably generating serious damage to many businesses. But some will come out stronger than ever, namely there will be winners even in industries where we can expect the most serious damage – tourism, hospitality and beauty, for example.

In fact, a handful of players in those industries and others will be reborn more energetically and find a renewed sense of purpose.

Consequently, how can this minor trend become a reality for a majority of enterprises?

We certainly need more transformational leaders that are value creators, who can make a difference but who are, above all, **game-changers** doing five things really well, whilst being aware that attempting to change fundamental aspects of organisational culture can be especially disruptive and can generate strong emotions [20]:

1. Craft their organisation's **collective ambition**;
2. Build a **collective leadership** capability;
3. Drive innovation through **next generation, organisational capabilities**;
4. Align messaging with metrics and rewards (**promises made/promises kept**);
5. Revitalise through continuous learning and a development-**talent factory**.

Nevertheless, is the presence of game-changing leaders a sufficient condition for organisations that are subject to internal tensions and paradoxes that are characteristic of transformation trajectories?

There are at least five internal tensions that make the successful implementation of enterprise transformations really difficult. They are [21]:

1. **Revitalisation** against **Normalisation**: Companies find themselves "in conflicted situation of needing revitalisation, but desiring the same time normalisation".
2. **Globalisation** compared to **Simplification**: "The complexities brought on by globalisation are often in conflict with the need for organisations to make it simple for customers to do business with them". "Creating organisational responses that address the need to master globalisation, whilst offering customers and employees process simplification", is vital and reinforced by the COVID-19 pandemic episode though a value chains reconfiguration. Will we, therefore, assist with some processes of reshoring to mitigating against different kinds of risks, preserving the environment and protecting social mechanisms that are in place, or will we try to consider all these facets in conjunction with the economy to define a new system that is more sustainable and resilient?
3. **Innovation** against **Regulation**: The tension is "between the desire to boost innovation and the need to operate under increasing regulation".
4. **Optimisation** versus **Rationalisation**: The duality here is "between optimising benefits to customers while rationalising costs of doing business".
5. **Digitisation** versus **Humanisation**: The objective is "how to reconcile the increasing need for the digitisation of business models with the increasing desire to create organisational climates that have an authentic sense of humanisation", namely businesses that are really endowed with a noble purpose.

Moreover, instead of dealing with these tensions one by one, they must be considered together, in all their completeness and as a whole, in order to be able to offer sustainable and agile organisational structures adapted to an uncertain future and currently in full recomposition mode after the episode of the COVID-19 pandemic.

In this framework, game-changing companies that are able to be agile, must be, according to Ready *et al.* [22], purpose-driven, performance-oriented, and principle-led (figure [13]) in order to contribute to a new sustainable, robust and resilient world allowing a long-term, smart equilibrium between

human activity and the planet carrying capacity, avoiding any economic decline if one comes to refer to the demonstration brought in part 3 of this paper.

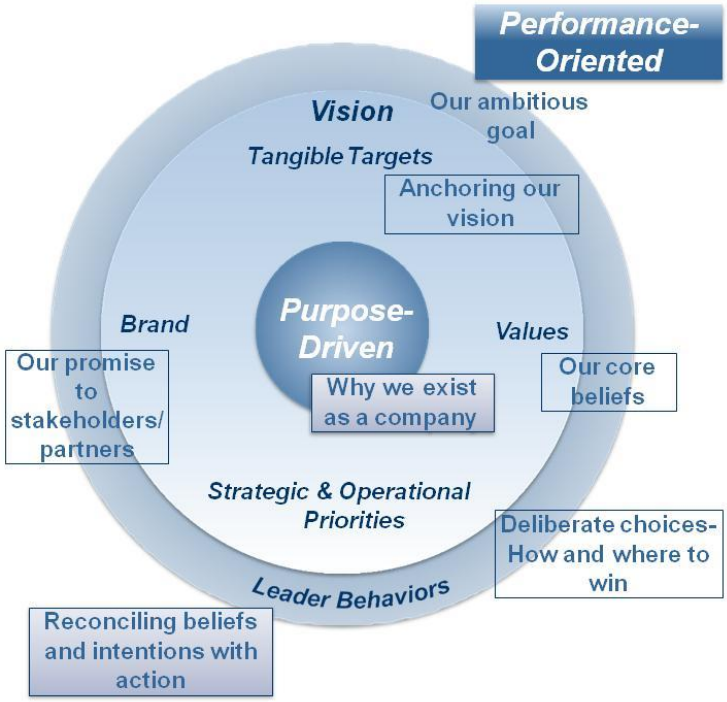

Figure 13: Company's Collective Ambition Compass (Source: Ready[10])

[10] Ready DA. Shaping Your Organization's Collective Ambition. MIT Sloan School of Management. 2016.

Conclusion and Further Work

This work has brought to light the springs that allow us to redefine our relationship with nature and to reconfigure the world in which we evolve, following the schism caused by the SARS-CoV-2 pandemic.

Beyond the scenarios developed here and there by various experts and futurists that do not really allow an assessment of the underlying uncertainty and indirectly join the now famous words of Donald Rumsfeld "… there are **known knowns**; there are things we know we know. We also know there are **known unknowns**; that is to say we know there are some things we do not know. But there are also **unknown unknowns** - the ones we don't know we don't know…", highly hypothetical situations should be questioned in order to be able to accurately identify the real problems to be solved and to try to provide adequate answers. In the absence of such an approach, the breakthrough innovations that are so highly sought after and the deployment of "Blue Ocean" type strategies [23] at the macroeconomic level to surely embrace the 4th paradigm and its different variations, will not take place and the construction of any cleaner, more resilient economy will be compromised.

The formulated questions in the ESIMOP/PROMISE sustainable development methodological framework, encompassing different facets to be favoured concomitantly and not according to a certain logic of compromise inducing a mercantile approach, make it possible to grasp the complexity of the system in which we operate, in order to be able to finely define its characteristics and to model it appropriately, highlighting the non-linearity of its intrinsic mechanisms, the unreasonable exploitation of common goods, the limits of technology and the eventual collapse of human activity, if over-consumption behaviour continues like it did in the pre-COVID-19 era.

With a few important exceptions ([24], [25], [26], [27], [28]), indeed most of the research on sustainability continues to focus on technological solutions, whilst the actual leverage point, voluntarily limiting our consumption, remains mostly repressed, particularly amongst our business and political leaders. Whilst this is not easy to realise, especially at a corporate and personal level, times are presently changing and mentalities are ready to evolve. More than ever, we must seize this opportunity.

In the same vein, relaying the Consolandi and Eccles study [29] on the 17 Sustainable Development Goals (SDGs) for 2030, "the sectors that are particularly important to the SDGs are health care and consumption, followed by resource transformation and non-renewable resources. Transportation, services and finance become less important", which notably confirms our conclusions for a more sharing economy towards, for instance, the sharing of

energy and the mitigation of negative externalities in transportation and industry amongst others, positively contributing to favour, in the long term, the earth's regeneration capability and increasing its carrying capacity.

Disclosure Statement

No potential conflict of interest is reported by the author.

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5 About EMNES

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