

Achieving Environmental Resilience and Other Sustainability Goals through the Insurance and Pension System

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ABSTRACT

Climate change and other environmental and social concerns challenge current economic models and behavior. Yet, the *Archimedes Lever* to move the earth is in the hands of our financial systems and how we redesign them. It starts with governments who need to move away from the pure monetary view of economics. National budgets, which are currently cash-flow based, need to be transformed into valuation metrics that account for environmental and social costs and benefits. Since much of the latter are "externalities", they are not embedded in markets and business entities' considerations. Hence, the private sector alone cannot drive the necessary change and cannot reach by itself a new required equilibrium that reflects the pursuit of Sustainable Development Goals (SDGs). This is why acute government and regulatory intervention is needed.

International initiatives reflected by the Paris Agreement and the UN SDGs highlights ambitious plans that require global investment of many trillions of dollars annually. It is unrealistic to assume that government budgets are able to finance such huge investments under their current structure.

In this paper we claim that such financing should come from the Insurance and Pension system (as well as social security plans). The global Insurance and Pension industry have the required funds and ability to deploy such huge investments, If properly inclined.

We argue that regulators and governments must act to remove barriers and provide incentives for insurers and pension funds to invest in infrastructures and technologies that mitigate climate change adverse effects and that promote environmental resilience and sustainable development. Actions taken should address widely and commonly agreed SDGs. We claim that such actions are economically warranted from governments' standpoint. We explain that this is due to cost and benefits related to externalities and other market-wide benefits, such as enhancing financial system's stability and mitigating erosion of retirees' income under the current low-interest-rate environment.

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Introduction

The era we live in has been named "the Anthropocene", reflecting the fact that humans have become the major force inflicting changes on our planet.³ Many of those changes brought prosperity to humankind, yet in recent years it has become increasingly apparent that the way we treat the environment is threatening our very existence on this planet.⁴ This is evident in climate change, pollution of soil, air, oceans and water, the massive disappearance of biodiversity and the depletion of rare minerals.

The way we, humans, affect the environment has been tied to economic development. The last 20-30 years have marked the finale of the industrial revolution and the rise of the post-industrial era. The ecological crisis of the present has roots in the Industrial Revolution.⁵ Massive production and energy deployment were unleashed to meet the growing needs of ever-increasing population and consumption. In contrast, the post-industrial era has introduced greater awareness for resource management and new technologies to cope with the environmental disaster.

However, modern post-industrial era has also accelerated consumption dynamics and spill-over effects to a point that brings to mind Lewis Carroll's seminal words: "... here we must run as fast as we can, just to stay in place. And if you wish to go anywhere you must run twice as fast as that."

There are three factors that can help us run "twice as fast" in the race to saving our lives on this planet:

First, is to drive massive scale *infrastructures and technology* investments that are aimed at coping with climate change and other sustainability issues – this is where global money should go.

Second, is to provide the right incentive schemes that obtain this first objective – that should be done by restructuring national budgets and private-sector economic incentive schemes. It involves readjusting the underlying accounting measurement systems to capture environmental and social costs and benefits, including embedded externalities.⁶

³ See, for example, Crutzen P.J. (2006) The "Anthropocene". In: Ehlers E., Krafft T. (eds) Earth System Science in the Anthropocene. Springer, Berlin, Heidelberg.

⁴ See, for example, Ceballos G., Ehrlich P.R. et al. (2015), "Accelerated Modern Human-Induced Species Losses: Entering the Sixth Mass Extinction.", Science Advances Volume: 1, Issue: 5.

⁵ See, for example, Caradonna, J. (2014), "Is 'Progress' Good for Humanity?", *The Atlantic*, Sep. 2014.

⁶ Some of the technologies themselves may bring with them financial innovation and solutions such as alternative forms of money and accounting. See, Sir Ronald Cohen & George Serafeim "How to Measure a Company's Real Impact", Harvard Business Review, September 3rd, 2020.

Third, is to tie-in the insurance and pension systems (as well as social security plans) to provide trillions of USD to finance these required huge investments. Governments and regulators should actively intervene by removing barriers and providing incentives. Such actions should be supported by the now restructured and geared budgetary-incentive-and measurement systems, as indicated above.

Climate Change and the Principles for Sustainable Insurance (PSI)

The Stern report (2006) on the economic implications of climate changes made a bold statement that the benefits of strong, early action on climate change far outweigh the costs of inaction. It also claimed that many trillions of dollars are required, annually, to prevent a catastrophe.⁷

This report had created quite a stir in the insurance industry and has driven major European insurers to call for action and study the implications. Among other things, the insurers have established a committee with UNEP, which after several years of work has published the Principles for Sustainable Insurance (PSI). A treaty based on those principles was signed at the International Insurance Society conference in Rio (June 2012), in parallel with the UN conference on the environment (RIO+20). Most leading insurers joined the PSI, during or right after the conference.⁸

However, although the PSI addressed adequate issues relevant to property and casualty (P&C) insurers and P&C insurance coverage, the principles disregard ample implications for the Life and Pension business. The PSI are focused on mitigating actual losses in the property-casualty line of business. Although this issue is tackling the direct risk for insurers, it is far from exhausting the major implications for insurers in general, much of which is outside the scope of P&C Insurance. It is also inevitable to note that the prominent kind of P&C risks addressed by the principles (e.g., damage from heavy tidal waves, wildfires, etc.) are typically either uninsured, or covered predominantly by governmental schemes rather than commercial/private insurance or pension plans.

It would be constructive to upgrade and revise the PSI as necessary to express the huge challenges to Life and Pension Insurance and Savings due to climate change, and to reflect the important role of Life and Pension Insurance and Savings in providing financing to deal with climate change (as well as

⁷ Stern, Nicholas (2006). "Stern Review on the Economics of Climate Change", Government of the United Kingdom, 30 October 2006

⁸ One of the authors, Kahane, was a speaker in the International Insurance Society (June 2012), where he supported dedication of trillions of dollars to the insurance and pension funds. He was also a member of the Israeli Mission to the UN Rio+20.

to meet global SDGs) by investing in real and digital infrastructures that are aimed at resolving or mitigating adverse consequences.

The amount of required funding for such a magnitude of funding (trillions of USD) and the long-term nature of these investments, make pension entities (social security, pension funds and life insurance) the most suitable candidates to provide such funding while at the same time catering to the needs of pension clients and other mid and long-term savers.

The Sustainable Development Goals (SDGs) and Implications for Required Investment

It took a long time for the world's nations to reach a consensual framework of sustainability.⁹ On December 2015, 23 years after the groundbreaking conference in Rio, the United Nations' COP21 in Paris was the stage for setting a major paradigm shift: declaring not just a political framework, but a legally binding international treaty on climate change, referred to as the *Paris Agreement*¹⁰. The treaty, adopted unanimously by all countries, is aimed at reducing global greenhouse gas emission, where its goal is to limit global warming to well below 2 degrees Celsius (stretching for a target of only 1.5°C rise).¹¹

That same year the United Nations General Assembly decided to reach *Agenda 2030* - Sustainable Development Goals (SDG).¹² The SDGs are 17 goals that not only refer to climate change, they also include targets to end poverty, build stronger economies and safer, healthier, and more livable societies everywhere. The SDGs were determined by consulting with a large and diversified group of entities and organizations from academia, government, business, NGOS, etc. The result added more quantitative targets and indicators (environmental and social) to the ones regarding climate change.

⁹ A major obstacle to reaching a practical international consensus about environmental and social issues has been the conflict between developed and developing countries. However, in moving from poor to rich, a country does not have to go through the "dirty" stage (Von Weizsacker et al., 2005). Rather, a country can get "rich and clean" by using circular models like the well-known "Cradle to Cradle" (Braungart and McDonough 2008) and other models described, for example, by K.H. Robert's "The Natural Step".

¹⁰ Six countries have signed the agreement but never ratified (Iran, Turkey, and Iraq are the top emitter: 3.2% of the global emission).

¹¹ The goal not to exceed 1.5°C has not been met, and we are struggling to keep predictions below 2°C. (It should be noted that 0.5°C average warming has a crucial meaning for life on earth).

¹² In 2000 the Millennium Development Goals (MDGs) was introduced to reduce extreme poverty. In the Rio+20 Brazil, a UN resolution on Forum on Sustainable Development was created, and in September 2015 it has been approved.

The implications for future investments required globally to meet the targets are estimated at \$8-14 trillion a year. Financing these huge amounts of investment is an outstanding challenge. Where would it come from? The global sum of all government budgets is closer to \$30 trillion and constrained by the need to fulfill all government's roles. This is insufficient to close the SDG's gap - common observation show that nations are lagging and failing to meet those targets and make the necessary investments. Governments, especially under current national accounting and incentive systems, are struggling to allocate sufficient budgets for these purposes.

We believe there is a solution, a 'perfect match` to be made for this predicament.

Financing Sustainable Development through the Insurance and Pension System

Natural candidates for financing long term infrastructure projects (including advanced technology infrastructure projects), are the Insurance and Pension industries. In fact, we argue that those industries also have major interest in promoting sustainable development projects.

First, the Insurance industry has direct adverse effect from Climate Change and other environmental damages – in P&C as well as in Life and Health, and its portfolio investments. Pension funds are also subject to direct effects on related disability and mortality coverage that they provide, as well as direct and indirect effects on their long-term investments.

Of the indirect effects (some would claim it is a direct effect), transition risk would plausibly be a prominent one that has potential significant negative effects on Insurance and Pension investment portfolios.

Another consideration that makes the Insurance and Pension entities optimal candidates is the typical long durations of such projects, and the embedded liquidity and risk premium features that appeal to such entities, in particular in the current low-interest rate environment. The potential of devising stable income streams from such projects is another appealing character. As the ability to get inflation-protection when investing in those projects (assuming that income can be adjusted based on market conditions and is retained in real values).

Still a big caveat may be that those features are not priced well enough due to different market shortfalls or barriers (for example, regarding Digital Infrastructures). In some jurisdictions investments in tech companies may be restricted or barred due to being considered "too-risky" for pension investors, or yield a still not attractive enough return, compared with alternative

investments. The resulting outcome in such an economy where the afford-mentioned externalities are significant (i.e., high potential welfare and environmental gains to the public) would be outright under-investment.

The only way to resolve that under-investment problem would be for government to step in and provide additional benefits in the form of tax incentives, guarantees, or other incentives. Sometimes it would be sufficient for governments to remove barriers or restrictions.

On a macro-prudential level, some of the environmental risks, Climate Change for example, are rendered a major prominent emerging risk in the Insurance Industry and by insurance regulators. This is true, as mentioned before, even when over-looking some adverse effects on the Life & Pension system. Therefore, it is vital for regulators, who oversee the stability of such entities, to persuade and lead governments to provide steps and incentives that would drive more investments into those Environmental Resilience (ER) Infrastructure projects.

As elaborated before such regulatory request that would elevate potential stability threats to the Insurance and Pension Industries, would also collide with government and public interest to resolve the under-investment problem in favorable environmental infrastructure projects.

It is worth noting that when looking at financing such long-term investments of trillions of USD, institutional investors like the Insurance and Pension companies are probably not only the best candidate to consider, but in many cases the only suitable candidate unless the government itself takes upon itself such financing. To some extent such financing can go through banks as well, but banks typically provide debt rather than equity financing, which is also required in such cases.

On top of the previous arguments, it is important to highlight that solving the under-investment problem through the Insurance and Pension system would also solve a rather critical problem in the current prolonged low-interest-rate environment: securing a decent retirement financing for the pension of the millennial generation. The relative high yield generated from these investments would not only guarantee protecting the earth for their sake, but it would also support the economic well-being of that generation in retirement.

Zeroing in on the Rational for Deploying the Insurance and Pension System

The solution we suggest relies on pension plans around the world, which on one hand can provide that magnitude of private financing and on the other hand obtain particular benefits from such investments (especially if such investments are enhanced by additional government incentives). The

rationale for those additional government incentives is driven by embedding externalities and Macro-level cost-savings.

Life insurance and Pension funds (including social security) need long term solid investments to back up their liabilities under life insurance policies and pension programs. A typical investment for them is a long-term bond of 25-40 years. Interest rates play a key role in creating attractive policies and retirement plans. High yields are a necessary condition for attracting more savings and providing for decent retirement amounts.

Achieving high returns, especially on more solid investments, is challenging in the near-zero interest rate environment of today. There are little incentives to save money at those rates. One way out of the low interest rate trap would be to shift back attention from consumption to savings and investment, long term real investments. Long term infrastructure projects in general are less correlated with securities markets, marked with higher yields, and have embedded inflation-protection given that income streams are typically adjusted for inflation (directly, by linking to inflation indices, or indirectly through periodical price reversions).

Seeking returns, asset managers sometimes turn to more risky investments, like collateralized loan obligations (CLOs) and other financial instruments. This potentially exposes the Life Insurance and Pension Industry to excessive market risk that can affect the stability of insurance companies and pension funds actuarial balance.¹³

Since governments and regulators seek to minimize the stability risk of insurance companies and pension funds' deficits, they have an interest in minimizing such excessive market risk.¹⁴ Therefore, they should encourage investments that have a more stable and solid risk profile, and positive contribution to the overall risk and return of the `pension investment portfolio`.

Long term infrastructure investments that cope with climate change risks and promote other SDGs should be therefore encouraged by explicit and implicit government incentives in order to enhance the yield achieved on those investments. These kinds of investments typically have long durations, have a substantive income component that balances out asset volatility, and have low correlation

¹³ Pension funds imbalance and worries about pension funds deficits have shaken national pension systems in several countries that as a consequence moved from defined benefit (DB) plans to defined contribution (DC) plans. DC plans impose the plan's risk on the members in the plan, i.e., the employee themselves, and increase the exposure to failure due to excessive market risk.

¹⁴ The Financial Stability Board, for example, have recently highlighted risks related to increasing investments in CLOs and other financial instruments. FSB Report (December 2019), "Vulnerabilities associated with leveraged loans and collateralized loan obligations".

with capital markets and therefore contribute positively to the risk of the `pension investment portfolio`.

Another strong and even more direct motivation for governments to provide yield-enhancing incentives to such investments are social and environmental benefits, such as reduction in carbon emissions, positive impact on population health and job creation, etc. These benefits would be typically regarded as “externalities” i.e., others such as the government or the public, but not the investors directly, get the benefits.

The ability to offer high yields on "impact investments" will create a self-perpetuating cycle: higher returns on retirement plan portfolios will increase the attractiveness of retirement schemes. This, in turn, will motivate larger long-term savings and thereby enable financial institutions to finance more impact investment.

The Challenges

Changing the Economic Incentive Schemes and Accounting Measurement Systems

Traditional economic theory has assumed three major resources that are involved in production: land, labor, and capital. Each of them is limited, resulting in the principle of "scarcity". However, our modern life is characterized by a "new economy", which give rise to more relevant, “unlimited”, and fast-growing resources such as data, knowledge, information technology and other technologies. These resources have reshaped every aspect of our life. Borderless and wireless communication, massive computing power, artificial intelligence, robotics and more – have changed not only production, but also the impact on humans and the environment in a way that is not well addressed by ubiquitous neo-classical economic models.

The traditional economic approach is almost exclusively neoclassical, adopting a version of expected utility theory with human welfare. Usually translating into contemporaneous private market consumption (or producers' surplus) in the applied models. These models typically rest on assumptions of fixed preferences and utilities that can be aggregated and converted into well-behaved social welfare functions. All factors can be converted back and forth into monetary terms with no irreversible effects or disruptive consequences that are deeply uncertain and multi-faceted.¹⁵

¹⁵ Joseph Stiglitz (2012) argues that the invisible hand is invisible because it is not always there.

New economic approaches suggest some fixes to these caveats. For example, the neoclassical Cost-Benefit Analysis has been replaced by a Multi Criteria Analysis. This has been developed in management science and applied to sustainable development (Munda, 2005)¹⁶, where socio-economic, ecological, and ethical perspectives are considered.

Also, in the traditional cost-benefit analysis, the form of the expected probability function is simply assumed, converting any and all uncertainty into “certainty equivalence”. Using long-term risk-free discount rates and growth rates that are almost entirely exogenous in the models, ignoring the endogeneity that is coming from policy choices that affect model parameters as well as uncertainties occurrence.

The prevailing neo-classical models clearly missed attributes, trade-offs and values related to the environment. One issue of particular importance that has been typically overlooked by the literature is regarding the consideration of *inter-temporal preferences and effects*, which have become more imminent.¹⁷

In more plain words: if we want to make sure that our economic behavior today is not detrimental to future generations, we should internalize this into our economic models, economic planning, and incentive schemes. Growth prospects that do not consider the way we treat the environment today will come to haunt us in the future. This is the idea behind sustainable development of land, for example.

A more realistic general modelling approach is based on institutional structures. It emphasizes the impact of economic incentives, the outcomes of economic behavior, the effect of economies of specialization, learning (knowledge) and technology, and the importance of accounting measurements.

Improper accounting for inter-temporal preferences is a key flaw in prevalent neo-classical models. These models are often characterized by future lives discounted in value relative to present lives of similar quality. The argument that because people in the future are expected to be better off in real money terms, so that we can then deeply discount a monetary value of their lives or their health, runs into serious logical and moral problems.

¹⁶ Munda, G. (2005) "Multi-Criteria Decision Analysis and Sustainable Development". In: Figueira J, Greco S, Ehrgott M, editors. Multiple-criteria decision analysis. State of the art surveys. Springer, NY.

¹⁷ The issue of inter-temporal preferences also has implication for proper accounting and incentives schemes as is shown, for example, by Bareket M. (2001), "Investment decisions under capital constraints: The role of revenue recognition in performance measurement."

Externalities

Another issue which needs to be addressed is lack of externality accounting. "The economics of welfare", written by Pigou, was the first manuscript to introduce the modern notion of economic externalities.¹⁸ It refers to the effect on the environment and other people's well-being that is exogenous to the immediate micro model, i.e., the cost-benefit analysis of the immediate producer-consumer setting. The same is true for the capital market setting. In order to change the behavior and attitude of economic players towards environmental and social effects, we should enforce a change in the microeconomic model and the capital market model. This would be done by restructuring the incentive mechanism on a national-level, capital-market level and firm-level to properly account for such externalities. In other words - internalizing environmental and social effects into the microeconomic and capital market models.

Pension and the Effect of Low Interest Rate Environment

When the world was in an agrarian period there was no need for a pension. Life expectancy was short, and people were living in closed societies where children (typically the first-born son) took care of their parents' needs when growing old. Community assistance was also a source of reliance for the eldest.

Pension is a relatively young concept that has been developed only about 150 years ago, after the industrial revolution.¹⁹ In order to provide young savers a reasonable pension at retirement, savings should start relatively early. This will allow the compounding-interest effect to kick-in at significant power. Except for time, the effect of compounding interest is of course highly dependent on the level of interest rates along the saving period. Long periods of low interest rates (let alone negative rates) are diminishing the compounding effect and the ability to grow deposits into decent amounts that would suffice for retirement.

By compounding over a lengthy period, the interest differential is quite dramatic.²⁰ If a person works from the age of 25 to 70 and saves \$1,000 dollar per year, assuming there is no inflation, and the

¹⁸ Pigou, A. C. (1932), "The Economics of Welfare", Fourth edition. London: Macmillan.

¹⁹ See a brief discussion on Pension history in Appendix 1.

²⁰ The intention here is to make things easily understood, therefore we have ignored certain actuarial calculations, that are secondary in importance. See, for example, E. Baranoff, P.L. Brockett, Y. Kahane, and D. Baranoff, *Risk Management for individuals & Enterprises Flat World*, 2019.

money grows by 0% for 45 years, he saves \$45,000 dollars. If that person needs about \$210,000 to provide for his retirement, then he will need to save each year not \$1,000, but about \$4,700 ($210,000/45,000$). However, if that person saved with a 6% interest rate a year, then \$45,000 becomes \$212,000. In this case that person can be OK with saving only \$1,000 a year, which is about one fifth of the annual pension savings.

As simply demonstrated above, the yield on pension savings is crucial in determining the level of income a person can obtain at retirement. Minuscule interest rates cut significantly accrued funds, which in turn reduce retirement income. Yet, even worse, low interest rates also deter individuals from saving for pension. This, of course, exacerbates their financial condition in retirement.

Therefore, high yield on pension plans is necessary to increase motivation for higher pension savings and for keeping savers better off. It is the same ingredient that is crucial for raising the large amounts of money that are required for "impact investment".

Conceptual Framework Considerations to Address the Challenges

Utilizing Multidimensional Metrics

The change that happened during the Anthropocene Era requires a paradigm shift. One cannot solve a problem by following the same principles that created it. It is apparent that the traditional one-dimensional microeconomic setting, which focuses on monetary value maximization and ignores environmental and social effects, has lost validity. Outgrowing beliefs that people should not serve the economy, but rather that the economy should support their basic values, support this paradigm shift. At the base of a fresh reconstructed paradigm, "doing good" (socially, environmentally, and ethically) should support, rather than stand in contradiction to, "doing well" (economically).

Metrics do not merely serve as tools for measuring results. They actually act collectively as compasses or a dashboard, leading us on our way. Using inappropriate metrics leads us in the wrong direction. There is an urgent need to add non-economic dimensions to the dashboard. This is the way to move from an industrial world to a post-industrial world. We must replace the current focus on the "maximization of economic values" with a multidimensional framework that includes consideration of Economic, Societal, Environmental, and Consciousness factors ("ESEC"). Alternatively, we can view

this as “maximization of economic values”, subject to constraints on Societal, Environmental, and Consciousness factors.

The SDGs can serve as an approximation and a compass to understand what metrics may be relevant. The goals are not a perfect tool for measurement, however, there is wide consensus and recognition of them, so they may serve as one of many tools to create a widely accepted multi-dimensional metric.

Accounting for externalities

A way to address the lack of accounting for externalities is by changing the model setting from a 'local optimization' problem to into global optimization, when trying to maximize investment returns. We can do this by considering externalities and real-time value of money for very long durations. By accounting this we can appropriate consideration of risks, including environmental risks and social risks (including low retirement income risk).

Typically, such a global optimization that considers the effect of such externalities (which are affecting public goods) is not done by individuals or firms, but rather by governments and international bodies. Therefore, regulators and government officials should encourage governments to provide incentives to institutional investors and other capital market participants. In order to drive the right level of investment in environmental resilience projects that would benefit the economy globally and in the long run.

There are different ways of “internalizing” (endogenizing) externalities so that they can be added to the yield of the investor or reduce the risk of the investment.

It is possible, for example, to use certain market mechanisms, and to include these in investment yields. Other mechanisms may be tax incentives, subsidies, credit guarantees, and revenue guarantees for projects, safety-nets to provide for a minimum yield, etc.

However, the motivation of governments to provide such incentives often relies on how measures like that are captured by the national accounts, and thus are affected by national accounting standards and their implementation. To make SDGs and the endogenizing of externalities a government priority, one should make sure the accounting is adjusted to reflect the relevant economic utilities and costs that the government should consider when making its decision.

Enhancing Environmental and Social Resilience through Investment in Advanced Technologies

Advanced technologies have drastically changed production in a way that contributes to the impact of humanity on the environment. New technologies have removed processes from "mass production" into more lean production methods that do not require tremendous investment, and that has significantly reduced the net marginal cost of doing things in many areas.

These in turn have affected the volume of supply, speed to market, price, and consumption, in a way that has magnified the impact and pace of change on our environment. The effect is sometimes positive – especially when new tech players are replacing incumbent players that are polluting or causing other harm to the environment, but at the same time other technologies may in fact increase adverse effects on the environment.

Innovations like automation, robotization, AI and GPS considerably increase productivity and affect the quality of many peoples' lives. However, when assessing related economic gains or losses there is often disregard to social welfare improvements/deteriorations and positive/negative contributions to the environment. This in turn impairs our ability to fully assess the sustainable value of new technologies.²¹

It is clear that, if purposely designed, certain new technologies can help us deal with our challenge to conserve the environment and mitigate unfavorable human behavior in a faster way than ever before.

In that sense, COVID-19 gave us a vivid illustration of how things that would normally take years to change have changed within weeks. This has drastically affected major sectors and areas of our lives: travel, education, work and more. It has also affected our perception of what is permanent and what is not, as well as our perception of economic cycles and planning horizons. By the same token we should infer of our ability to rapidly change dynamics in favor of preserving the environment.

This concept is closely related to an idea presented by Stuart Hart.²² Hart (1997) builds on a framework presented more than five decades ago, by environmentalists such as Paul Ehrlich and Barry Commoner, who made the following observation about sustainable development: the total

²¹ See, for example, Hart S.L. and Christensen C. (2002), "The Great Leap: Driving Innovation from the Base of the Pyramid", Sloan Management Review, Fall 2002.

Also: Patala S., Jalkala A., Keränen J., Väisänen S., Tuominen V., and Soukka R. (2016), "Sustainable value propositions: Framework and implications for technology suppliers", Industrial Marketing Management, Volume 59, 2016.

²² Hart S.L. (1997), "Beyond Greening: Strategies for a Sustainable World", Harvard Business Review 75, January-February 1997.

environmental burden (EB) created by human activity is a function of three factors. Namely: population (P); affluence (A), which is a proxy for consumption; and technology (T), which is how wealth is created. The product of these three factors determines the total environmental burden. It can be expressed as a formula: $EB = P \times A \times T$.

This formula was used for decades to show how changing fundamentally the technology used to create wealth would affect environmental burden. This concept gave rise to promoting the use of 'clean technologies'. Hart (2002, 2003) stretched and reshaped this idea further to show how technology (T), when moved to the denominator in the original formula, i.e., $EB = (P \times A)/T$, can accelerate our ability to decrease environmental burden.²³ We further claim that advanced technology infrastructures are our best way to challenge climate change and other adverse changes to our environment.

To make development and investments in new technologies align with our objective of being environmentally resilient - we should, first, measure the impact of new technologies on environmental resilience. Then, we should incentivize the development and investment in such technologies that create the most effective and sustainable impact.

We should not let the COVID-19 crisis "go to waste" (as the old Churchill saying goes). We should harness digitization to change human behavior with respect to climate change and other environmental effects. For that purpose, we should take advantage of widespread use of digital applications and leverage our ability to share data, coordinate, and instantaneously influence change on a global level. Governments and International organizations should prioritize digital infrastructure projects that have positive and effective long-term environmental resilience benefits.

If you struggle to finance it – "infrastructure" it!

The digital revolution is impacting every aspect of our lives, from how we interact and do business to how we live, educate, and socialize. It can also have a profound impact on our environment and the extent to which we preserve it to provide for sustainable life on our planet and good quality of living. Identifying and defining projects is not sufficient without safeguarding financing to projects that may be very large in scale (and thus require large amounts of investment). It may take a few years to build,

²³ Hart, S. L., & Christensen, C. M. 2002. The great leap: Driving innovation from the base of the pyramid. Sloan Management Review, 44: 51-56. See also, Hart, S. L., & Milstein, M. B. 2003. Creating sustainable value. Academy of Management Executive, 17: 56-69.

may be relatively risky due to new technology development and implementation. It may hold some public benefits that cannot be extracted privately, that are not readily monetized, or that are non-monetary by nature.

Therefore, we believe that they should be structured as public-private infrastructure projects. This would require governments and international bodies to provide economic incentives that would enable rendering stable-long term income streams from such projects. Thereby making them attractive to Institutional Investors and other capital market participants.

This can be done by establishing proper economic measures to identify advanced technological projects that can serve as "infrastructure" and which enhance environmental resilience. Designing the right incentive schemes by governments and global bodies and catering to investment needs of major capital market participants would allow to finance mega projects (which often hold considerable risk). This can have a groundbreaking impact on humanity and its struggle with acute challenges such as climate change, and other environmental and social challenges.

Sustainability Budget

One way to solve the lack of funding for impact investments is by the government assigning a "sustainability budget" (or a development budget) parallel to the general budget. In this budget all the fines collected for "negative" externalities (non-monetary) are accumulated (and it is in the hands of the government if it is to be subsidized by the general budget).

The advantage at play here is that this budget has income from taxation of branches of the economy that may hurt it in the future and subsidization of positive branches of the economy that may benefit it in the future. The government may also choose to transfer control over such a budget to an external player.

To involve capital markets, these "sustainability budgets" should be guaranteed by the government by bonds that are pinned to the rate of inflation and should be given to certain companies to distribute as a subsidy to all the "positive" externalities, according to defined conditions. Since this arrangement creates a substantial gap between the subsidies' rates and the common interest, these bonds will be non-tradable throughout their maturity (except for some exceptions) thereby incentivizing long-term commitment. Since this arrangement is a long-term investment, they do not

need to credit the same short-term fees. By implementing this condition, this can save a lot of money for savers.

The indexing of the bond can play a role for capital markets while the governments' role will be around anti-inflation policies. Governments should lead a policy to substantially increase long-term investments, such as infrastructures, including "impact investments", encourage such investments by pension funds and social security systems, and provide incentives to motivate such investments, as necessary.

The basic economic rule should be acknowledged: The main bridge of the "present economy" and the "future economy" comes out of savings. Whether private or public savings, if a national economy wants to survive and grow, it must make investments in that economy and make the proper conditions for such investments to produce decent returns, including all public and private benefits.

It is again good to emphasize that private benefits alone will not suffice to move the needle. Government intervention is needed to account for externalities and other public benefits that were acknowledged worldwide (by all countries) in adopting the SDGs and in particular in climate change goals.

Governments have plenty of instruments to set the agenda and dictate the pace of changes. They can do this by changing rules, taxation, budgets, subsidies, and regulations. There is no way the business community can do it alone, and therefore as much as it may make sense for pension asset managers to go this route, in many cases such investments would not cut the risk-return test without providing government incentives, as highlighted in this paper. Without a change to current reality, there is little motivation to save money, fewer and fewer robust long term investment opportunities that fit pension portfolios and little appetite for financing impact investments.

A Second look on Measurements, Accounting and Budgeting Systems – A call for Future Research

Measurements to Support Government Policy, Budgeting and National Accounting are abundant and important. We see this as a discussion and an evolving field. We must aim to assess how an investment yield (measured only by financial data) might also incorporate the "impact" that investment has on society (including employees, customers, surrounding community, etc.) and the

environment. This is not an easy task. Although to date there is no 'state of the art' model that we can follow, there are more studies in recent years that try to cope with this conundrum.

Currently there has been some sporadic work done by different bodies on measurements related to impact investments and responsible investing principles. A plethora of alternative metrics exist spanning the gamut and alphabet: There are voluntary approaches in the sphere of Corporate Social Responsibility (CSR) that are facilitated by the Global Reporting Initiative (GRI²⁴) and Sustainability Accounting Standards Board (SASB²⁵), there are scorecards²⁶ and certifications²⁷. There are accreditations such as Bcorps²⁸, and a variety of metrics measuring different aspects of impact such as ESG²⁹ metrics, Ecological footprints³⁰, Social Value Metrics³¹, Social Return on Investment (SROI³²), Principles for Responsible Investment (PRI³³), Sustainable Finance Disclosure Regulation (SFDR) to mitigate greenwashing and as a measure for accountability, and many more such initiatives.

Many of the tools and dashboards that facilitate such metrics are employed by organizations that voluntarily care about the impact that they create such as IRIS+ used by the Global Impact Investing Network (GIIN). This means that these metrics are more a matter of moral and principles which, sadly, are not drivers of economic change. Therefore, we do not see wide adoption of these tools and we do not have consensus around them or their applicability.

We believe that a more structured accounting paradigm should be developed. Such that, for example, would account separately for "positive" and "negative" impact effects, in line with how accounting theory observes assets and liabilities, income and expenses. Examples for "negative" effects can be the input of "bad" materials, the use of non-renewable energy, the cost of disposing waste, cleaning polluted water, soil and air, as well as inflicted damages of pollution, etc. Negative effects, for example, can trigger special taxes and penalties. Positive effects can be, for example,

²⁴ <https://www.globalreporting.org/>

²⁵ <https://www.sasb.org/>

²⁶ <https://www.multicapitalscorecard.com/multicapital-scorecard/>

²⁷ <http://leed.usgbc.org/leed.html>

²⁸ <https://bcorporation.net/>

²⁹ <https://www.investopedia.com/terms/e/environmental-social-and-governance-esg-criteria.asp>

³⁰ <https://www.footprintnetwork.org/>

³¹ <https://socialvalueint.org/>

³² [https://www.investopedia.com/ask/answers/070314/what-factors-go-calculating-social-return-investment-sroi.asp#:~:text=Social%20return%20on%20investment%20\(SROI\)%20is%20a%20method%20for%20measuring,create%20value%20for%20the%20community.](https://www.investopedia.com/ask/answers/070314/what-factors-go-calculating-social-return-investment-sroi.asp#:~:text=Social%20return%20on%20investment%20(SROI)%20is%20a%20method%20for%20measuring,create%20value%20for%20the%20community.)

³³ <https://www.unpri.org/>

value of recycling, nurturing soil, conservation, producing renewable energy, moving into "Cradle to Cradle", etc., which can be credited with subsidies. Such subsidies may have come in different ways: lower interest, tax rebates, safety nets, etc.

A new National Accounting paradigm that would better account for the national net economic benefits from an investment, including accounting for long term welfare effects, would support government policy to encourage or ban specific investments that influence environmental or social goals.

Under the current national accounting system, that relies heavily on current cash flow streams, there is very little information about long term effects and non-monetary benefits. Thus, leading to "short-Termism" of government's decisions and ignoring many attributes relevant to the public and the health of the economy in the long run.

Such new paradigms had started to develop in recent years. The concept of sustainable development has encouraged a development of integrated environmental and economic accounts following the concept of "Natural Capital Accounting".

The underlying premise of natural capital accounting is that since the environment is important to society and the economy, it should be recognized as an asset that must be maintained and managed, with its contributions (services) measured and considered in decision making.

In 2012, The United Nations adopted an official international framework for Natural Capital Accounting - the System of Environmental-Economic Accounting (SEEA) that links and relates environmental statistics to general economic statistics included in the National Account Systems. The SEEA was designed with the following objective in mind: to integrate into the standard macro-economic analysis the related environmental consequences of any underlying economic activity captured by the standard National Account statistics. This also considers government environmental measures (like environmental subsidies or taxation) and the environmental-economic link is done on an entity level. For example, pollution levels caused by a producing industry can be linked to the specific economics of that industry.

On March 2021, The 52nd United Nations Statistical Commission, adopted the System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA). The Ecosystem Accounting

(EA) component complements the central framework of SEEA by addressing contribution to human well-being in the form of identifiable ecosystem assets and services.

One of the key set of accounts in EA are the *Ecosystem Monetary Asset Accounts*, which record information on stocks and changes in stocks (additions and reductions) of ecosystem assets. This includes accounting for ecosystem degradation and enhancement.

These accounts provide an estimate of the total annual flow of services that is generated during the accounting year. The value of the ecosystem assets can be estimated by capitalizing the value of the annual flows of services over the ecosystem's expected lifetime using the Net Present Value method. The valuation of natural capital flows allows for the estimation of natural capital asset value and more comprehensive assessments of the wealth of a country (covering natural capital in addition to produced capital, financial capital, human and social capital). Thus, can lead to better decision making that promotes sustainable value of national economic growth.

We believe that more research should be done in this direction, which can help governments to devise a policy that enhances environmental resilience and sustainable investments.

Concluding Remarks

The pivotal achievement of bringing together the world's nations to reconcile around Paris Agreement's Climate Change Goals and UN SDGs should be leveraged to full power by using the Insurance and Pension Industry.

In this paper we showed that there is a relatively simple way to reach the solution for these pressing problems:

1. Amending National Accounting and Budgeting so they include economic measurement of long term Environmental and Social impacts (such as the SDGs) in order to set national investment priorities.
2. Providing incentives to enhance the risk-return profile of necessary technological infrastructure investments.
3. Using the Insurance, Pension and Social Security systems to finance enhanced high-yield impact investments. This may raise questions as to the lack of ability to trade bonds, pin prices

and save costs. There will be a massive saving of costs in the long term compared to short term fees.

4. The idea of a "Sustainability budget" to complement a national budget and compensate for non-monetary metrics should be introduced as a form of long-term financing. A good tool may even be "outsourced" to a third party.

We can simultaneously deal with three major and pressing global challenges:

- The mitigation of major environmental and social threats through substantial impact investments that also increase stability in financial markets
- The creation of jobs and revamping economic growth amid the recent crisis.
- The re-establishment of retirement security for millennials and future generations, providing for appropriate accretion of real value on retirement savings.

In short, we have the chance to hit several ambitious and extremely urgent targets with a single arrow: Fighting climate change's adverse effects and financing SDGs, better safeguarding pensions to the Millennials, and enhancing job creation and economic activity.

Appendix 1: Pension and the effect of compounded interest

Pension is a relatively recent concept - only 150 years old. In ancient times, there was no need for a pension system. Life expectancy was short (It was less than 35 years at birth during the 18th century, and thereafter it has steeply increased, especially due to better hygiene and medical technology),³⁴ and a major part of the population lived in traditional agricultural large families where family members cared for each other and in particular across generations. The Industrial Revolution caused this structure to break apart. Most of the young people moved to cities with a small family. They needed a new way to deal with everyday risks of life (sickness, pre-mature death, and old age). The Chancellor of Germany, Otto Von Bismarck, has led in 1883 the inception of social security (providing pension to employees that were forced by law to retire at a certain age), and medical insurance. Other countries in Europe, Japan, and more, followed suit and began their own social security system and other insurance and pension funds plans even before WWI, and by WWII most other developed countries did the same.

Most funds were governed by the unions, the employers, or the government. The risk of the fund was distributed between the employee and the employer, and in some cases the government. The pension plan was basically a Defined Benefit Program – DB. The way it worked is that members paid a certain percentage of their salary and would receive pension benefits at a given percentage of their salary at retirement or upon occurrence of an insurance event (death, sickness, etc.). It should be noted that under DB, the plan's benefits were not in correlation with current interest rates, or other ongoing market and economic conditions, and were also independent of mortality rates. However, along time such structure made employers, insurers, and the pension industry justifiably worried about real possibility of deficits in the funds.

Due to that, a major change occurred some 40 years ago. Almost all insurance companies and pension funds switched to a Defined Contribution – DC. This means that the employer and employee still transfer a certain percentage of their salaries into their various insurance and pension funds as was previously done. However, the retirement benefits were no longer set as a given percentage of salary, but rather are based on the amounts accumulated in the fund and invested in capital, credit, and money markets alongside other assets. Thus, that amount is affected by current and future interest

³⁴ Galor, O. and Moav, O. (2005), "Natural Selection and the Evolution of Life Expectancy", Brown WP.

rates and other market conditions. Under DC plans, the market risk as well as all other risks are carried by the fund members (i.e., the employees), on a mutual basis.

Most people want to work until a certain age - the retirement age (different countries may have different mandatory retirement age and that age may be dependent on gender and may be changed over time). In order to allow retirees a reasonable pension, the savings would have to start as soon as possible, and the amount saved also depend on the funds yield, which is affected by interest rates. By compounding over a lengthy period of time, the interest differential could be dramatic. As can be seen in the following example: ³⁵

Suppose a person works from the age of 25 to 70 and saves one dollar per year, assuming there is no inflation, and the money grows by 0% for 45 years, he saves 45 dollars. If the person saves with a 6% annual yield (interest rate), then \$45 becomes \$212. The following table contains a simple sensitivity check with yield being the varying factor.

Yield (Interest Rate)	Pension Fund Amount at Retirement (45 yrs)
0%	\$45
2%	\$72
4%	\$121
6%	\$212

³⁵ For the sake of simplicity and focusing on the effect of compounded yield, this example ignores certain actuarial calculations and assumes no change in life expectancy.