ELK COAST INSTITUTE

FOR MINDFUL SUSTAINABLE INNOVATION

Energy Equity Summit

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Network Capital: Applying an effective framework for energy equity solutions

1) Why this is important: Resources for Scale

There is no single silver bullet or single solution to be deployed. 1,000 shots on goal even with a single technology require multiple types of innovation around deployment, partnerships and roles. Effective deployment at scale requires resource efficiency.

Silver bullet single solution proscriptive solutions approaches to complex problems almost always fail. See William Easterly.

2) Why today is Broken: example voluntary carbon

i) No scale

ii) stories v. outcomes

iii) Uncertainty of "purchase" outcomes

iv) No factors for co-benefits

3) **What has worked in finance (what can we learn) credit markets**

i) Moving from stories to factors of effect in terms of projects
ii) Development of risk/factor tools
iii) Independent raters and reviewers are required
iv) Risk taking insurance aids in private sector risk management
v) Regulators for ratings & insurance products
vi) Institutional scale assets and portfolios (global resource allocations)

4) **What is proposed**

i) Focus on normalized effects. Buying / investing in effective outcomes vs. prescriptive solutions to maximize degrees of freedom among actors and innovations
ii) Constrain the risk factors of desired effect to normalize it. i.e. 20 yr outcome with 95% certainty threshold to normalize cost v. outcomes.
iii) Build portfolios and tools for normalizing capital deployment
iv) Create the policy / market environments for risk insurance & raters independent
v) Identify cofactors (to enable purchase management of co-benefits) innovation, social development, biodiversity etc. factor

5) **What this may enable**

i) Scale and finance, innovative public / private sector innovations for deployment
ii) Outcomes at scale multi factor
iii) Incorporation of normalized non-financial outcomes = Energy equity: examples engagement of people's hours for some duration with x level of energy quality.
iv) Co-benefit factors associated with energy access: education, healthcare to be incorporated if they desire is weighting co-benefits or externality costs

6) **Who is involved (roles and actions)**

i) Capital project initiators issuers, to identify the outcomes they deliver. ROEs return on effect

ii) Policy/regulators to define "outcome targets" and any public support investment for outcomes

iii) Finance, to initiate, package and bundle "effective products & portfolios"

iv) Technology to track/assess effects

v) Consumer/beneficiaries

vi) Various NGO / regulatory policies to define "effects" principles & guidelines.

7) **Where to start**

i) Pick outcome metrics to measure and incorporate effects beyond the horizon of capital

ii) Pick the effective constraints to normalize outcomes to allow matrix risks, roles and engagements in a non-prescriptive manner.

iii) Identify the risk factors

iv) Sequence the roles & goals

Extended Version:

Network Capital: effective framework for energy equity

Why this is important: Maximizing Resources for Scaling human potential at scale

Many efforts are under way to support or somehow contribute to various Sustainable Development Goals. The SDG framework is a novel rubric for categorizing efforts associated with long term human development. The SDGs are designed to enable collective thinking and support to maximize human potentials across time and geographic scale. These goals are likely beyond individual actors, agents or even nation states normal frames of reference and action such as long-term environmental impacts etc. Depending on the actor's range of influence here and now may be disconnected in terms of feedback to larger and longer scale effects even if those effects are net positive for society in aggregate.

The SDGs offer goals for framing collective action, but more robust frameworks are needed to scale and organize the physical, fiscal, technical and legal resources required for success at scale. This paper proposes an “effective” framework to engage and harness fiscal resources from private sector capitalism and public sector investment at scale as efficiently as possible with efficiency being net positive effective outcome relative to effort and resources expended.

The proposal put forth in this paper is called Effective capital. The objective is to scale resources brought to bear on the SDG’s as efficiently as possible by focusing on outcomes that are normalized across projects and efforts. This allow individual actors and small projects to escape the trap of selling and managing projects at story scale to have resourced channeled using factor based allocation.

Why today is Broken: example Corporate actions in the voluntary carbon markets

A big problem facing humanity for the coming decades is climate change. This problem caused by us placing 40-50 gigatons of CO2e yearly into the atmosphere is a pollution problem coupled with the dynamic growth of the industrial and post-industrial era. For framing the scale of the problem, at a $60/ton price we are facing a $2.4-3.0 trillion/yr problem. One paper estimates damages at €180/ton[1]. This cost to minimize waste damages sounds large but falls well within global economic capacity measured at $80 trn/yr[2]. We face an organizational failure, not an economic or technical capacity issue.

One set of innovation brought to bear on this is the voluntary carbon market ecosystem. This market-based ecosystem has innovated many solutions for offsetting, capturing and avoiding CO2e emissions over the last 20 years with talented and well intentioned people. As of 2021 the market which is driven primarily by voluntary corporate purchases is estimated at $1bn/yr and sees credit retirement activity, a metric of activity of roughly 100m tons/yr. This represents %0.25 against 40,000m tons of CO2e pollution. Corporations are following the Friedman[3] dictat and maximizing profit today individually at the expense of collective good tomorrow. This is an individual rational actor tragedy of both the commons and horizons[4].

Corporate v. consumer willpower

Marginal Consumer actions on climate are an untapped ocean of potential. For context the global cat food market is $32/bn yr with Cats releasing about 100m/ton/yr CO2e. This means the global voluntary carbon market could be doubled and neutralize all cat's CO2e for a 4-5% increase in Cat global cat food prices[5].

The voluntary carbon market lack of scale is due to multiple factors. Many efforts are under way to scale the market significantly. Research by the TSVCM (Taskforce for Scaling the Voluntary Carbon Markets) calls for a 100x increase in size.

This paper proposes that, "you can't get there from here." i.e. that the current cottage industry needs to evolve a new set of actors, roles and goals for scale and that in these lessons and proposals may lie a framework for scaling other SDG's beyond climate.

In all complex systems the rules and roles change as scale changes. Unlike basic physics, organizational ecosystems and their economic effects are not scale invariant. Typically as scale of flow or system processing increases by an order of magnitude new structures (actors and functional roles) emerge.

Stories v. outcomes

One of the limiting structural factors driving the current voluntary carbon markets is the "what" gets purchased and "why" voluntary carbon is purchased. To date, the standardization of a 1 Metric Ton of CO2e carbon offset, avoided, adjusted etc. is a generally agreed unit.

The currency unit of carbon is a 1 metric ton, a serious limitation as it fails to acknowledge the longer term effect of the avoided, offset or removed ton. The climate operates at long scale effects and so an applied solution that is reversible in 10-20 years may be nearly functionally inert relative to the problem. Time scales matter solutions must map to problems.

Imagine multiple domestic US banks offering "US dollars" and the inefficiencies associated for trade flow & development[6]. Carbon projects idiosyncratic nature etc. all contribute to this. The current effort and actors fall broadly into 3 buckets

Role	**Goal**	**Problem**
Project developers	Sell today's project, sell tomorrow's outcome 1 yr or 2 yrs at a time	Ad-hoc funding, no forward curve for offtake and cheaper debt finance. Large upfront costs, limited economies of scale
Issuing bodies/standards	Risk and performance rate, review and issue credits	Risk rating and issuance are highly concentrated across a range of projects & methodologies

Corporate Purchasers of projects	Buy credits and make annual claims about “greenness” or something	They buy stories v. facts. Performance is uncertain, projects are idiosyncratic and therefore complex so purchases don’t scale due to information / expertise asymmetry

Uncertainty of "purchased" outcomes: “What am I buying? Really”

Uncertainty around what is being purchased means gross inefficiency. Risk is directly proportional to appetite for investment. The current carbon market’s risk factors are numerous and range from policy uncertainty to fraud. Carbon failure, the release or failure of the 1 ton premise isn’t a well-defined or a widely discussed issue, rather carbon default and environmental bankruptcy of issuers is treated as the unwelcome relative at the table who everyone hopes will appear infrequently, leave early and cause minimal bother.

Generally speaking, corporate purchasers acquire bundles of carbon stories to tell their stakeholders. The long-term effects of these actions aren’t material in that there is limited impact should things not quite pencil out. Everyone buys a few more credits in the following years…rinses and repeat.

No factors for co-benefits

In addition to minimal impacts or measurements of carbon failure, there is minimal formal recognition for social co-benefits. Many projects with co-benefits trade at a premium and are thus purchased in amounts that will allow a “claim” or story to be told to stakeholders. Co-benefits are purchased to provide halo’s for the annual portfolio rather than for demonstrative effect.

What works in finance & what we may learn: credit markets

Moving from stories to factors

One of the largest and most effective credit markets in the world is residential US housing. It has grown over decades from a cottage inefficient industry for capital allocation and investment. The quest for efficiency has had major bumps 2008-09 being a significant one, but the journey has instructive lessons on the maturation of resource allocation in terms of actors, roles and tools.

Like the voluntary carbon market, US housing credit market started out on a project by project activity. In the 1920's the average home loan had a 5-10 yr, duration, was issued, held and managed by a local banker. Every home and lender was unique and the banker relied on first hand knowledge of how much Mr. Jones liked to drink or Mr. Smith liked to work. Every home mortgage was created and managed as a story known to the banker who owned it. Today most carbon projects are purchased in a similar way.

Development of risk/factor tools

Over time the residential mortgage sector matured as risk became managed using quantitative factors to determine expected outcomes. Uncertainty went from narrative project to quantified units. This abstraction and normalized allowed for cheaper credit. Anticipated effectiveness of the mortgage over time moved from a cottage guessing game to a formalized practice with scientific approaches to uncertainty.

The only "free lunch" in finance is diversification. The largest pools of capital such as pension funds, sovereign wealth funds etc. know enough to seek out the free economic lunch of diversification subject to uncertainty. Gathering the narrative stories relevant risk expertise across geographies, markets and sectors is expensive if not impossible. Mr. Jones work habits don't map well to Mrs. Watanabe's. True global portfolio diversification based on narrative analysis is expensive or impossible unless risk exposures can be quantified and normalized.

The next phase of the mortgage loan market growth occurred as individual loans were assessed for effective rates of return using standardized risk scores as indicators of expected financial effective performance. When used in aggregate these individual loans

exposures could be placed into bundles known as CMOs (collateralized mortgages obligations) which performed approximately like bonds relative to risk and performance over time. Quantization and modelling of various aggregate risks created a trillion sources of economic flows benefiting lenders and borrowers.

Numerical risk factors for assessing portfolio effectiveness brought science to the “Art” of lending. CMO instruments could then be recognized as part of the “credit” asset class usable by large institutional investors. Mr. Jones loan was now cheaper for him and the offered institutions around the world portfolio diversification.

History of independent raters (feedback mechanisms)

You can’t get there from here using the same actors and tools, is the rule of all complex systems. The rules of scale for evolving systems are that new rates of flow and scale require the emergence of new functional structures.

As the ecosystem of lending flows scaled, new functional roles for formal and informal system regulation emerged. Independent but regulated agencies known as Raters emerged to assess the factors and data inside of the new CMO bundles. This loosely coupled approach meant flexibility among the rators to innovate while at the same time maintenance of a degree of rigor, independence and method to ratings approaches.

Now a “rating” is just an opinion and opinions are like belly buttons in that everyone has one. An important regulatory role emerged in the US managed by the NRSRO created an oligopoly on the quality, source and type of rating that would be recognized by fiduciaries responsible for pension funds, insurance companies etc. Note the loose coupling by design in this solution, not being overly prescriptive in terms of information solution, allowing for innovation in credit markets. Regulation by interpretation v. strictly codified compliance.

This ratings role meant large packets of capital could flow faster and further as many institutional investors could be “rated” securities without fear of suits associated with breach of fiduciary duty. Similar independent review managed in a loosely coupled regulatory framework with a defined safe harbor fiduciary lines drawn could be useful for other capital allocation ecosystems.

Risk taking and transfer via insurance products

Transfer and management of risk allows for different views and appetites for risk to be taken. In the credit markets, regulated insurance products, derivatives etc. emerged. These were broadly speaking successful in encouraging divergent views and risk diversification among a larger group of actors, leading to ultimately better managed risk and cheaper capital for economic development.
A notable exception was CDS (credit default swaps) where poor regulation of what is effectively an insurance product allowed for too high a risk concentration (see AIG 2008). It is important to remember however that these exceptions, while notable, stand out against a broadly functioning mature OTC environment for risk insurance products with multiple actors participating due to the opportunities for reporting, measuring and monitoring risk. Risk can be expressed as the uncertainty of effective outcome.

In the effective framework beyond traditional capitalism, the challenge lies in the effective horizon which is longer in duration than most entities' capabilities to pursue or manage. Government and institutional actors are likely required to put in place frameworks and backstops to support longer terms and diffuse project-based effect risks.

Regulators role for innovating effective ratings & insurance products

As shown previously the role of divergent 3rd party opinion information about effectiveness (ratings) and regulated insurance markets for the transfer and management of risk exposures can significantly grow an ecosystem producing a fertile area for innovation around desired effective investment.

The Regulator’s role is to create spaces either formal or informal such as sand boxes to both innovate and perform with operational familiarity for existing actor in the ratings and insurance space. Regulators can also set reserve ratios, minimum requirements and offer backstop pools to reduce counterparty uncertainty, which accelerates the initiation and transfers of risk based capital flows.

Regulatory consultation with stakeholders and clear signaling of intent are affordable ways to foster innovation in safe spaces for innovators and existing actors.

Institutional scale assets and portfolios (global resource allocations)

Institutional scaling of assets and portfolios can only happen with new products available in familiar but deep channels. This may require new regulatory definitions for safe harbor actions among capital allocators.

Tax and investment credit policies that recognize the longer term or diffuse nature of economic benefits associated with investing for long term horizon effects may be helpful. These policies should recognize that the benefits of individuals actions today may benefit society tomorrow either directly or indirectly through many transmission channels. The actions of individual actors should be priced accordingly to reflect over the horizon returns which may not accrue directly to those actors. Free money shouldn't be given away, but those pursuing long-term high-risk activities should be enabled with institutional actors recognizing that a portfolio of high risk bets today may be the only way to achieve tomorrow's desired effects.

What is proposed

buying effective outcomes

Goals today lead to outcomes which may drive or enable path dependencies far into the future. The correct accounting directly or probabilistically of these outcomes or effects needs to take place at longer term larger scale measurements. For example, investments in innovation technologies today may be "un-economic" today or look fuzzy, but multiple high risk shots on goal provide the options and pathways enabling economically viable solutions tomorrow.

Solar energy subsidies from 2005-2015 enabled the learning effects at global level across physical, fiscal, regulators and b-model innovations driving accelerating cost curve time horizons. The distortion of the solar market by feed in tariff incentives pulled the future forward making solar the cheapest source of energy on 93% of the planet.

Like basic research in science, economic investments into "effects" may not directly point to cost-effective solutions, but may provide the insight and knowledge to get further towards those end goals.

Public sector investments in basic research for effects coupled with longer term offtake investments for exploring effects at scale may prove beneficial to society at large beyond the current generation. Innovations that drive effects once learned scale rapidly at global levels.

Ultimately driving effective solution costs down drives equitable outcomes as today's indulgent rich luxury becomes an easily available good or service.

Constrain the effect to normalize it.

Many small early projects suffer as artisanal compared to the scale and effective outcomes needed. These projects are bought as stories and narratives like the earlier discussion of mortgages seeking capital. This means individuals must have local knowledge of the project and desired outcomes coupled with technical knowledge. Investing in stories does not scale as institutional capital can't manage stories due to the unstructured data overload.

Normalizing the "effects" of these projects can help institutional actors invest at scale. Normalization involves constraining the outcomes so that projects can be bought and managed on a "like for like basis." In credit the "risk" or effect may be normalized as annualized returns against a 95% probability of some $ loss at fixed period time. The same constraints can be placed on projects effects beyond the directly financial.

A climate SDG example would be the following. The desired effect in terms of climate accounting is likely CO2e avoided or removed measured in tons for some duration. If the 1 ton effect is normalized to an expected 95% likelihood for a 100 year horizon, projects with varying risk and horizons can be normalized by adjusting the "tonnage" required to meet the normal effe t requirement. This of course assumes the effective default events, Carbon default in this case are approximately IID [7]over the targeted duration.

Build portfolios and tools for normalizing

Portfolios can be managed on an effect and contributing factor basis. By normalizing story projects into factors contributing to effectiveness, tradeoffs in terms of cost and impacts can be made. All of the language, tooling and human resources available in the traditional finance world can be brought to the table when looking at solutions and managing capital allocations to some of the world's largest problems and opportunities for progress that are beyond the visibility and thus reach of traditional capital markets.

It is important to remember that projects have multiple effects, positive and negative. These effects can be normalized relative to SDG's with portfolio allocators making tradeoffs. While not a perfect solution it may prove a useful approach. The tradeoffs at project or portfolio levels between various factors are likely not linear or correlated in a stable fashion. To the degree the portfolio is constructed of discrete or independent elements risk can be diversified away mitigating the chance of "effective" failure due to over-concentration or unforeseen feedback loops or tight coupling of system factors.

The tools and ecosystem of portfolio management like Value at Risk, Dynamic Capital Allocation, independent risk/ratings, insurance of failure etc. may be applied once effects' factors are normalized.

create the policy / market environments for risk insurance & raters independent

Regulators can foster some of the required innovations for scale. The credit markets can offer an example here. The role of insurance as a regulated industry to guarantee risks can reduce the need for large balance sheets and time horizons beyond the capacity of small project level actors.

Recognized risk rating methodologies and actors can serve to accelerate the flows of capital to project and portfolio level actors by reducing uncertainty. Due diligence using trusted actors and approaches can reduce the redundant or costly diligence needed for distant capital flows.

Identify cofactors (to enable purchase management of co-benefits) such as innovation, social development, biodiversity etc. factor

Normalizing "effect" as an expected outcome for some duration with a fixed target of uncertainty would allow for other factors to be included in portfolio allocation decisions. Institutional asset allocators could determine the tradeoffs or balance for more subjective utility functions across the SDGs using objective measurement factors.

In traditional finance a single variant tradeoff of risk v. expected reward subject to variance is used to create efficient frontiers. A mathematically efficient frontier is a useful fiction that almost no one uses. However, by normalizing the risk reward factor tradeoffs conscious choices can be made for violating the frontier model's outcomes.

Creating a multi-dimensional effective frontier using basic linear trade-offs would allow groups to create naively weighted effective portfolios and then weight against them with justifications explaining their biases relative to preferences or expected failing in the basic model to correctly predict the effect and uncertainty of effect for the given duration.

What this may enable

scale and finance

Why all of this complexity? The simple answer is failure. Current asset allocation via the private "impact" sector and public sector FDI etc. are lacking. A global economy with over $80 trillion in GWP(gross world product) is leaving too many challenges unresolved compared to available capital flows.

A constant refrain heard by institutions and individuals is that interesting projects don't scale or that capital for meaningful impact (effect) far exceeds supply. One way of testing this hypothesis would be to normalize effect over time and uncertainty to see if the tools for scaling in credit ecosystems enables scaling in non-financial sectors such as SDG's.

In normal economic mechanisms, a tree has value when it is cut down. In an SDG normalized effect with a 100 year horizon, the ecosystem services, bio-diversity etc. contributions of the tree may correctly be reflected such that the tree is too expensive to cut down today. The only way this conclusion can be reached is if multiple stakeholders are using similar assumptions of "effect" to value this asset. Effects with longer duration can reduce the tragedy of the horizon by expanding the collective view and treatment of that horizon.

Effects at scale multi factor effective portfolios

These same factors such as human capacity building etc. can be assessed using larger group frameworks such that energy as a basic building block of human development and

capacity building may be correctly benefit priced relative to its effects across multiple domains including human capacity, environmental preservation etc., climate etc.

Portfolio and policy managers able to view multi-effect portfolios may then assess the “biggest bang for the buck” from a given capital allocation or regulatory act of conservation etc.

When we see, think and act with longer term horizons and across multiple factors collectively better decisions can be made. In addition, normalized factors allow for better political discourse in “Selling propositions and policy” to stakeholder be they regulators, voting populace, investors or corporate actors as investments with positive payoffs.

Energy equity: examples of engagement of people’s hours for some duration with X level of energy quality.

Energy is a human development building block. Over time humanity's ability to capture, harness and apply energy has been tightly coupled with progress in key human development indicators. Pricing the cost of “under energized” populations and the benefits and effects normalized to 20 or 50 year time horizons may put the upfront cost of policy and investment into better perspective. Too often public sector investment is couched as spending vs. investing.
More energized societies are likely to have individuals achieving higher levels of human potential in health, educations and general well being. These factors all drive economic development and political stability, highly desirable effects.

Co-benefit factors associated with energy access

Energy like physical paper money is functionally useless. Energy is an enabler which enables security, health, education, and key human effects up and down Maslow’s pyramid. These extra and contributary effects are important to factor-in when making resource allocation decisions.

Full effective accounting may show that equitably distributed energy is greatly under-estimated as a gateway to human progress and development. Though beyond the scope of this paper, it is suggested that a 20-40 year human effectiveness should be factored in when making decisions about energy to match the cost and functional lifetimes of energy related investments.

Who is involved (roles and actions)

Like life and making impacts at scale, highly effective energy equity is a team sport with discrete roles and enabling control functions. Below is a brief summary of some required roles and goals for participants in a large scale effective ecosystem. Having a shared language of network capital and effective outcomes normalized to factors at a 20-50 shared time horizon allows for coordinated and more efficient actions to be taken by various actor types.

Normalizing the time horizon of effect is important as typically different actors work at different time scale and modes. This is known as understanding the PACE-Layer[8] model of the effective ecosystem. Robust, resilient ecosystems have multiple actors with functional activities and action/feedback time horizons that may differ by orders of magnitude. The boundaries of activity and shared vision can help coordinate these actors' effects. A pace layer model of the ecosystem should be created before embarking on policy. Some of the actor's potential steps and goals are enumerated below.

Capital project initiators issuers, to identify the outcomes they deliver. ROEs return on effect.

Capital allocators typically work in 4-7 year effective time horizon and the co-benefit effects of their actions, be they positive or negative, may be invisible to them. Capital allocators in the private sector require functional buracracies enforcing tax or regulatory incentives to lens their decision making to the correct effective outcomes and horizons. i.e. investment tax credits, capital weightings or credits to tilt allocations to the over the horizon effects.

Policy/regulators define "outcome targets" and any public investment for outcomes

Policy makers are required to appropriately frame and shape the rewards and penalties associated with net effects, whether it is penalties for pollution or incentives for investments that pay social and economic dividends over the horizon that most corporate actors are designed to respond to. Example basis research in science effectively buys many long-dated options that are diffuse but collectively realized as technological advances benefitting human progress.

The basic research activities undertaken today by individuals gets realized as progress by everyone potentially over generations. Energy equity may function the same way, wherein the collective benefits of newly enabled security and education play out over generations. Pricing the economic benefits at a society level in normalized effective terms can make early public sector investment more politically feasible.

Finance, to initiate, package and bundle "effective products & portfolios"

The tools and language to normalize effective return will enable choices to be made at scale for projects and also move beyond the scale of “projects as stories” to projects as effective factors to be initiated bought and sold.

Technology to track/assess effect

General tools for finance for portfolio construction based on quantitative risk and return factors over a normalized outcome duration can be built, expanded or repurposed to review and allocate capital to optimize for effective outcomes.

Consumer/beneficiaries

Language for consumers and beneficiaries should be created to support engagement of thinking about the real relevance of effect and choices. We understand the aphorism of the 2nd best time to plant a tree is today with the best time being 20 years ago. This same framing for beyond the horizon or group outcomes that require individual actor behaviors today need to be created by marketers, artists and storytellers to foster deeper cultural and consumer understanding of the vital links beyond the horizons of near and now.

various NGO / regulatory policies to define "effects" principles & guidelines.

NGO and independent cultural holders of “trusted opinions” such as scientists, researchers and civil actors who frame the debates should be engaged to frame or acknowledge activities when sensible to be framed in effective 20-50 year etc. language. Co-ordinated action required trust and coordinated understanding why acting in the near and now to effect the far tomorrow is so important and valuable.

Where to start

Pick outcome metrics

A logical starting point is to pick initial effective metrics. These would allow for normalization of projects and outcomes. An example of a metric for energy would include the desired effect at human scale. Example would use a human centric metric of quality and users over a duration of time such as 20 human years at 2KW/capacity. This may be a more meaningful outcome metric than say installing 20MW of generating capacity as the effective outcome is measured per human unit over time.

Pick the effective constraints

Constraints in terms of effective outcomes are helpful to normalize outcomes and allocations decisions. Effective constraints are the target dimensions used to normalize efforts desired effect. For example:

Time: 20 yr
Energy delivered: per person/per year
Carbon captured: etc.

Another important factor in constraint picking is the acknowledgement of Risk and uncertainty in any projection. Example a 95% targeted expectancy per duration of 20 years allows for high risk projects to be normalized and play a role in a target portfolio vs being in-investable.

Identify the risk factors

As mentioned earlier the risk dimensions should also be acknowledged which will impact the potential effect. Risk factors such as political, climate, economic etc. should be framed on an impact v. probability weighted matrix so that their targeted impact on terminal effect can be assessed in a robust framework. Even if for example political or regulatory risks are low, probably low impacts in nature, a uniform risk framework enables better decision making and transparency into allocation processes. Managing a portfolio's of 100-1,000 projects normalized to 5-7 risk factors driving effects is likely easier than managing the 100-1,000 small cottage project stories alone.

Sequence the roles & goals

Energy equity or any targeted outcome requires multiple actors, using multiple tools for outcomes. Regulation, capital, technology, human capacity etc. may all be required but may arrive or mature to the proper level of usefulness for an effective framework at different times. Sometimes the private sector leads with innovation and sometimes regulations creates certainty or a safe operational space for private sector initiatives unfold.

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[1]

[2] https://www.statista.com/statistics/268750/global-gross-domestic-product-gdp/
[3] https://corpgov.law.harvard.edu/2020/09/17/the-friedman-essay-and-the-true-purpose-of-the-business-corporation/
[4] https://www.bis.org/review/r151009a.pdf
[5] Assuming a benign Marginal Abatement Curve Cost impact.
[6] https://link.springer.com/chapter/10.1057%2F9781137361219_2
[7] https://en.wikipedia.org/wiki/Independent_and_identically_distributed_random_variables
[8] https://everwas.com/2015/01/stewart-brand-and-the-pace-layer-model/