

# Forced Errors & Gains in economic potentials. Climate policy & carbon removal capacity building.

Notes from the field, Jan 2024.

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## Introduction: Understanding Potential Capacities

In economic development and sustainability, the concepts of capacity, forced errors, and forced gains play a critical role in shaping the trajectory of economic capacity and growth.

Capacity, in this sense, refers to the potential for productive activity within an economy or a sector. This capacity can be influenced positively or negatively by a range of factors, which can either accelerate growth (forced gains) or impede it (forced errors).

## Forced Errors: Impediments to Capacity Expansion

Forced errors are essentially policy or market dynamics that inadvertently create obstacles to capacity growth. They often result from well-intentioned but misaligned regulations or market conditions.

- 1. Overly Conservative Approaches to Risk:** Excessive risk aversion can lead to missed opportunities for growth. When businesses or governments are too cautious, they may avoid investing in potentially rewarding ventures, thereby limiting capacity expansion.
- 2. Bureaucratic Burdens:** Red tape and complex regulatory frameworks can significantly slow down the process of innovation and expansion. These administrative hurdles increase the cost and time required to bring new products or services to market, thus dampening the potential for capacity growth.
- 3. Corruption:** Corrupt practices erode trust in the market, deter investment, and skew the allocation of resources away from their most efficient use. This not only limits immediate capacity but also damages long-term growth prospects.
- 4. Confiscatory Taxation:** Tax policies that excessively penalize success or investment can discourage entrepreneurship and innovation, leading to a reduction in the overall capacity of the economy.

# Forced Gains: Catalysts for Capacity Enhancement

Forced gains, on the other hand, are interventions that intentionally bolster the capacity of an economy or sector. These can take various forms, such as financial incentives, policy reforms, or infrastructural investments.

**1. Risk Backstops:** Measures such as guarantees or insurance mechanisms can mitigate risk, encouraging investment and experimentation. This can lead to the development of new industries or the expansion of existing ones.

**2. Regulatory Easement:** Simplifying regulations or providing regulatory sandboxes for experimentation can accelerate innovation and growth. This makes it easier for businesses to adapt and evolve, expanding their capacity.

**3. Innovation Investments:** Direct investment in research and development, either through public funding or incentives for private investment, can spur breakthroughs that significantly expand economic capacity.

**4. Concessionary Capital:** Providing capital at below-market rates can enable projects or businesses that wouldn't be viable under standard financial conditions, thus expanding the breadth of economic activities.

**5. Forward Market Commitments:** Committing to purchase goods or services that are yet to be developed can provide a secure market for innovative products, encouraging investment and development in new areas.

## Conclusion: Balancing Forced Errors and Gains

In conclusion, the interplay between forced errors and forced gains significantly impacts the growth or contraction of capacity within an economy. Understanding and carefully managing these factors is crucial for policymakers and business leaders alike. While forced errors can create significant hurdles for capacity growth, forced gains can provide the necessary push to overcome these barriers and drive sustainable economic expansion. The challenge lies in identifying and implementing the right mix of policies and interventions to foster a dynamic, resilient, and growing economic capacity.

# Impact of Forced Errors & Gains on Economic Potentials

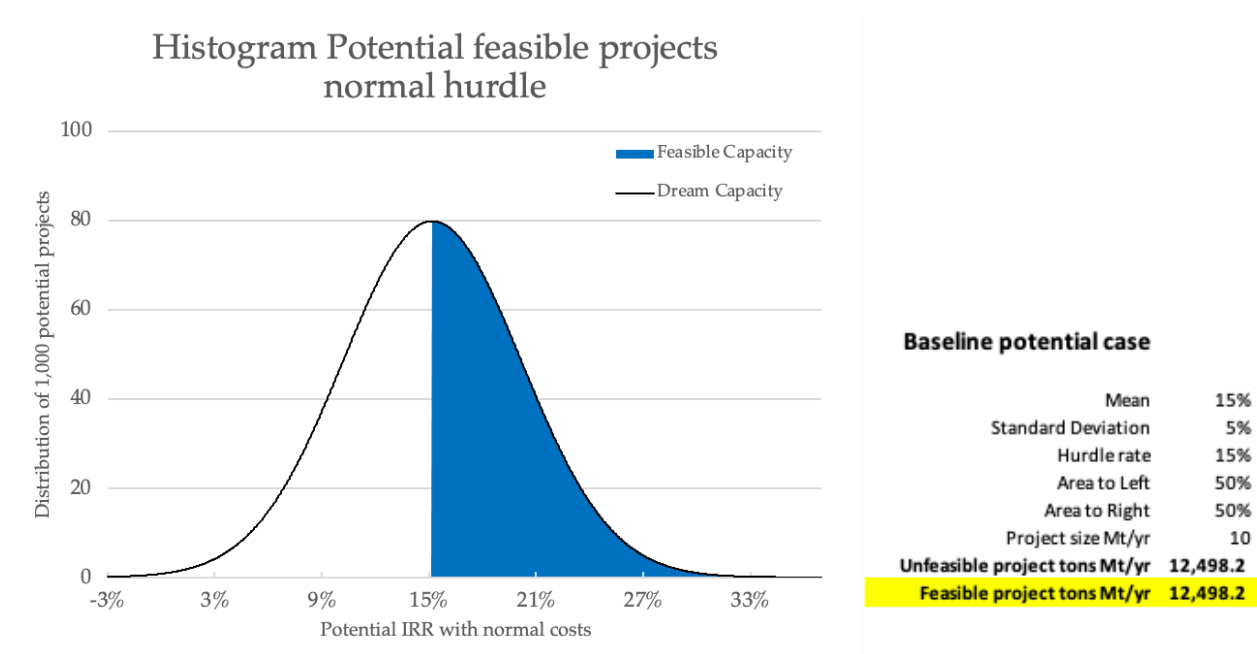
## Introduction: The math of Forced Errors and Gains

Forced errors and gains can significantly impact the viability of economic projects, particularly when viewed through the lens of a standard distribution of expected returns.

**A toy illustrative model:** Let's consider a scenario where we have 1000 “potential” projects with a mean expected return of 15%, a standard deviation of 5%, and a hurdle rate of 15%. Potential means they are at the “cocktail napkin stage” with working knowledge of real risks & returns.

The hurdle rate is the minimum acceptable return on investment for a project to be considered economically feasible. The potential projects at “cocktail napkin stage” might look like the following.

The potential projects deliver 25,000 Million Tons of removal capacity over their lifetime but only 12,498 Tons of capacity are Feasible due to the financial hurdle rate in this Toy model project universe.



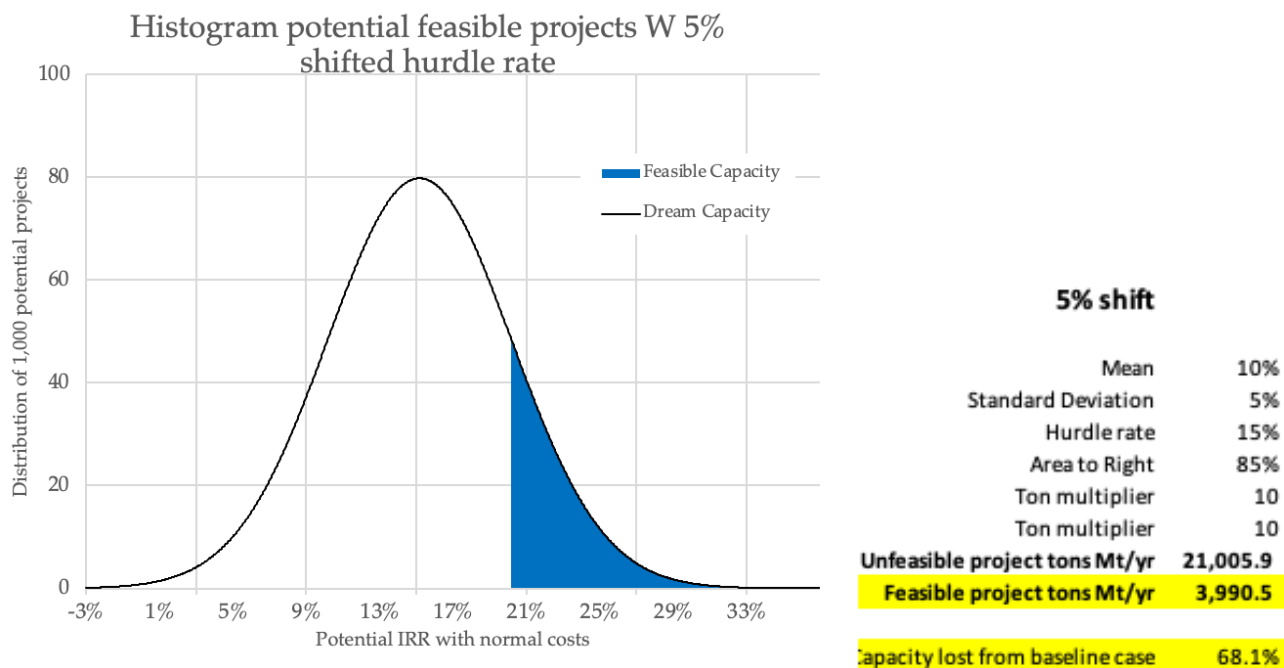
## Shifting the Distribution: Effects on Capacity

One can imagine systemic factors shifting the hurdle rate linearly (impacting all projects) a few % to the right or left. The shifting of this distribution to the left or right, due to forced errors or gains, can have profound impacts on the number of viable projects. The capacity shift is non-linear and isn't seen due to the survivorship bias in the data. Unfeasible projects that never leave the cocktail napkin are never heard from.

# 1. Shifting hurdle rate to the right (Forced Errors kill potential capacity):

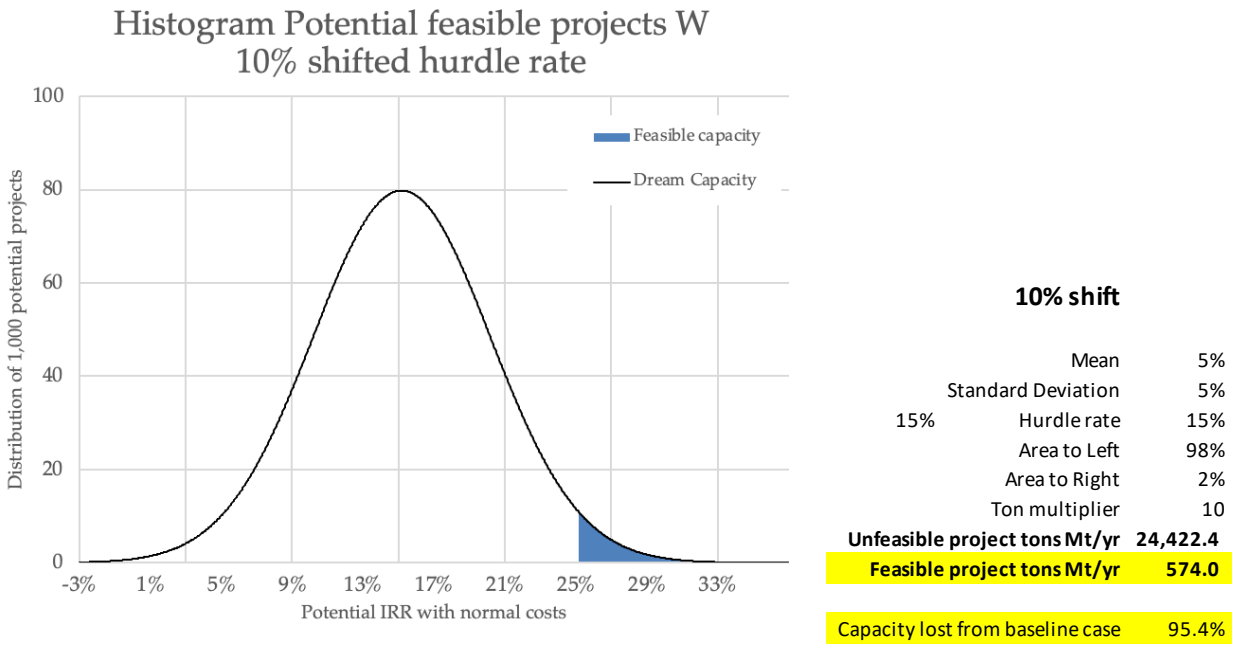
## 5% Shift leads to 68% loss of feasible capacity:

Shifting the IRR hurdle rate 5% makes some previously viable projects unfeasible, leading to a loss of capacity. This lost capacity never heard from or seen. It is hidden. This shift could be due any factor. Some examples could be over buffering by “conservative” actors, a national tax burden, corruption or any number of factors.



## 10% Shift: and loss of 95.4% of feasible capacity

A more pronounced impact is seen when the hurdle shift is 10% to a 25% IRR for potential projects. The majority of projects now yield returns below the hurdle rate, further shrinking the pool of feasible projects and reducing capacity. A 10% buffer pool destroys 95.4% of the market while increasing the remaining 4.6% of projects capacity by only 0.46%. This provides a strong counterargument to “conservative” risk treatment which may appeal to growing net capacity is shown to be rather weak.



The shift outcomes table shows the non-linear impact of “simple” shifts.

Baseline case		5% shift		10% shift		20% shift	
Mean	15%	Mean	10%	Mean	5%	Mean	-5%
Standard Deviation	5%	Standard Deviation	5%	Standard Deviation	5%	Standard Deviation	5%
Hurdle rate	15%	Hurdle rate	15%	Hurdle rate	15%	Hurdle rate	10%
Area to Left	50%	Area to Right	85%	Area to Left	98%	Area to Left	100%
Area to Right	50%	Ton multiplier	10	Area to Right	2%	Area to Right	0%
Project size Mt/yr	10	Ton multiplier	10	Ton multiplier	10	Ton multiplier	10
<b>Lost project tons Mt/yr</b>	<b>12,498.2</b>	<b>Lost project tons Mt/yr</b>	<b>21,005.9</b>	<b>Lost project tons Mt/yr</b>	<b>24,422.4</b>	<b>Lost project tons Mt/yr</b>	<b>24962.6</b>
<b>Feasible project tons Mt/yr</b>	<b>12,498.2</b>	<b>Feasible project tons Mt/yr</b>	<b>3,990.5</b>	<b>Feasible project tons Mt/yr</b>	<b>574.0</b>	<b>Feasible project tons Mt/yr</b>	<b>33.7</b>

## 2. Shift to the Right (Found possibilities & capacity gains):

Numerous factors and innovations may increase the feasibility of potential projects to significantly increase capacity. This is the mirror image of the non-linear diminishing capacity response. Subsidies and incentives are public sectors innovations creating these effects, with the desired intent to build capacity, incite innovation, reduce costs etc. as public sector goods.

### Examples of innovation in Carbon Credits and Insurance

In the context of carbon credits, risk management plays a crucial role in determining the viability of projects. Early carbon markets used centralized buffer hurdles requiring a certain Percentage yield from projects to be held in reserve by the issuing body. This made sense when markets were nascent, the ecosystem was small and loss history data was minimal. But innovation in risk management such as insurance is now vital.

The old centralized “conservative” approach, if overly stringent risk assessments, can shift the distribution of viable projects to the left. This might mean that many potential carbon reduction initiatives are deemed too risky or not sufficiently profitable, leading to a loss of hidden capacity in environmental sustainability. Getting risk wrong can create lost potential projects significantly diminishing carbon removal capacity.

Conversely, the introduction of insurance mechanisms in carbon credit markets can act as a forced gain. By providing a safety net against potential losses, more projects become viable, shifting the distribution

to the right. This shift unlocks hidden capacity in green investments, encouraging innovation and expanding the overall capacity of the sector.

Risk management innovation is needed as much as technical capacity and other innovations, to insure maximal, safe and effective carbon removal capacity development.

## Innovation Chasing Risk Efficiency

Innovation thrives in environments where risk is managed efficiently, not overly buffered. A balanced approach to risk management enables the pursuit of innovative projects that may have higher risk profiles but also higher potential returns. Efficient risk management does not mean eliminating risk but optimizing it to encourage innovative capacity building. This approach is vital for maintaining a dynamic and resilient economy, capable of adapting and growing in the face of changing circumstances.

## Conclusion: The Non-Intuitive Nature of Distribution Shifts

The impact of seemingly small forced errors and gains on the distribution of economic potentials is not always intuitive. Small shifts can lead to significant changes in the number of viable projects and, consequently, the overall economic capacity. Understanding these dynamics is crucial for policymakers and investors alike, as they navigate the complexities of fostering sustainable economic growth and innovation.

Getting risk “right” is more important than being “conservative”. The role of insurance actors, including auditors, regulators, underwriters and technical innovators is vital to insure rapid capacity development.

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**Follow on research for others to pursue:** The profound impacts of hidden costs on the potential for economic capacity development impact many factors that are largely ignored due to political or business norms. These factors that range from 1-5% each can diminish the economic capacity and development in sectors beyond carbon. Contributors factors could be Taxation, corruption, bureaucratic compliance, off-taker uncertainty, risks etc. All of these factors could be addressed in simple papers or documents like those above to highlight the “hidden” costs of what appear on the surface to be small factors. Whether it is a 68% reduction in carbon removal capacity, diminished economic industrial capacity or even diminished human development due to factors, getting the small things right is a huge opportunity to realize the more possible capacity development.

Follow on work example: **Carbon Project Taxes:** An example of Carbon Project Taxation is the costs of 4% ITMO tax proposed by the UNFCCC or some national Carbon project Tax proposals ranging from 5%-8% which if put into effect appear “reasonable” but combined not only diminish capacity but in the case of National carbon tax proposal my stifle economic activity and raise significantly less revenue on the remaining feasible projects.