

# Engineering Sustainability into Prosperity

Creating the Resilient, Productive, and Aspirational Future We Want

Opinion piece

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## ENVISION, FOR A MOMENT, HUMANITY'S FUTURE. WHAT SPRINGS TO MIND?

Perhaps a stark and minimalist dystopian landscape, where you co-exist with soulless robot companions in a simulated reality with damning social ratings by strangers, jaded by a harsh race for resources – much like a Black Mirror episode. Or is it an enticing vision of a vibrant and creative society, secure and prosperous, its acquisitions and aspirations in sync with the natural world?

Though many studies and our lived experiences indicate that we thrive in the security of our human connections, the richness of our cultural heritage, and the serenity of nature, popular media rarely portrays our future as attractive, abundant, and content. And so, as we stand in a stressed world of myriad crises, exacerbated by escalating climate risks, we are at the cusp of choosing – and creating – the future we want.

A future that is prosperous and aspirational, and yet sustainable and resilient, needs policies and processes that intentionally and proactively engineer sustainability into prosperity, instead of force-fitting ad-hoc corrective, and often punitive, measures into complex existing socioeconomic systems.

We must reimagine our lives and lifestyles – our food, clothes, homes, education and health systems, industries, transportation, recreation, amenities, and even luxuries, in the context of future activities, resources, and technologies. Economic well-being, the bedrock of societies and countries, must prevail, and in emerging markets and developing economies (EMDEs), people must get opportunities to

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better their quality of life and fulfill their aspirations. However, this must follow sustainable, low-carbon pathways.

The world, a half, or even a quarter century ago, was very different from today, and so will be the world a quarter, or half-century, hence. This systematic and foresighted imagining and construction of the future needs the active involvement of all stakeholders, with a concurrent whole-of-society, whole-of-economy, whole-of-government transformation, rather than small, incremental, linear changes to our current systems.

## THE UNSUSTAINABILITY OF BINARY THOUGHT AND UNILATERAL ACTION

The increasing evidence of our world afflicted by the disastrous impacts of the climate crisis and escalating, potentially irreversible, breaches of planetary boundaries, have spurred governments and industries to various degrees of action. But much of this action is reactive, sporadic, siloed, rooted in heavy-handed, haphazard legislation and myopic technocracy, and ironically, often, neither productive nor sustainable in the long term.

Public resentment of, and consequent political resistance to, many 'green' initiatives also arise from binary value judgments correlating prosperity, including a fairly high quality of life, to wasteful decadence. However arbitrary alterations to

economic and industrial systems risk triggering degrowth and collapsing societal structures.

Take plastics. India has a national ban on the manufacture and use of single-use plastics, but plastic-packaged commodities, from milk and water to food, cosmetics, and medical products, guaranteeing quantity, quality, purity, longevity, and convenience, are openly marketed as an aspirational evolution over loose-sold variants. Consumers, especially educated urban segments with high disposable incomes, willingly pay the premium despite awareness of plastic pollution and the ban, which is weakly enforced and ineffective in the absence of viable alternatives. Notably, parts of southern India, with higher per capita income and better standards of living, have higher than average plastic consumption (Duraisamy, et al., 2023).

Agricultural practices are contentious too. Each winter, the air over northern India thickens into a miasma with particulate pollution as farmers burn crop stubble. India's Supreme Court, responding to public outcry, directed stern action to end stubble-burning, despite the lack of efficient and affordable crop residue management technologies. This has led to thousands of police cases against farmers with millions of rupees in penalties, and strident protests from farmer unions.

In Europe, too, arbitrary and disruptive 'green' measures have triggered civil unrest. Media has widely reported about farmers in countries such as France, Germany, Greece, Lithuania, Romania, and Spain taking to the streets against the rollback of diesel subsidies for agriculture (Dwyer, 2024). Dutch farmers have unified to protest their government's proposal to buy or

shut down livestock farms to reduce nitrogen emissions (Tullis, 2023). The European Union (EU) has now withdrawn its proposed target to reduce 30% of nitrogen and methane emissions from the agricultural sector by 2040 (Wax & Matheisen, 2024).

Narrow technocratic solutions can also be socially, economically, and environmentally detrimental. Indonesia is shifting its capital from Jakarta, "the world's fastest-sinking megacity," in Java to the new "sustainable forest city" of Nusantara in Borneo. Jakarta's subsidence is caused by wells drawing groundwater even as the concrete core of its urban sprawl prevents replenishment of underground aquifers despite abundant rainfall. However, instead of restructuring the city's infrastructure and utilities to sustainably manage the groundwater system, it was decided to move elsewhere – though Nusantara's development has led to deforestation and displacement of indigenous groups, and subsidence may occur there too if solutions are not engineered into city systems.

Infringing upon the constitutional freedoms and privacy of people on the pretext of managing their emissions also has few takers. Even voluntary carbon credit cards, aimed at climate-conscious customers, that pried into purchase behaviors to measure carbon footprints and imposed monetary restrictions on those breaching their carbon allowances, have been short-lived in the US, Canada, and the EU (G., 2024).

#### **EMERGING MARKETS MUST GROW, AND FLOURISH**

EMDEs, home to two-thirds of the world's population and 88% of future energy demand (Bond, Ghosh, Vaughan, & Benham, 2021) must foster economic growth to im-

prove their citizens' lives and livelihoods and fulfill their aspirations. However, they must invest thought and resources in sustainable pathways that serve their socioeconomic imperatives while integrating climate resilience into their systems, instead of hurtling down the carbon-intensive trajectories of the developed economies that have perpetuated much of the climate crisis.

Such a sustainability paradigm would catalyze new ideas, resource-efficient business models, and future-oriented investments to drive "more dynamic growth and development" through "connected and coordinated actions" to deliver systemic transformations for infrastructure grids, transport networks, city systems, and agricultural and industrial processes (Stern & Stiglitz, 2023).

Mexico City, for instance, is tackling the root of its subsidence problem – caused by overdrawing of groundwater – by reviving Aztec-era floating farms. This nature-based solution, the Chinampas, is one of the world's most productive urban agricultural systems and also restores the city's groundwater aquifers (InterlaceHub, 2022). Economic hubs like Vietnam's Ho Chi Minh City, Myanmar's Yangon, China's Tianjin, India's Ahmedabad, and Bangladesh's Chittagong, ranked among steadily subsidizing cities, could employ similar traditional and nature-friendly system-level innovations to manage their rapid growth and water use.

India, the world's largest democracy with 1.4 billion citizens, is set to become its third-largest economy within this decade. This is a whole-of-nation, real-time experiment to become a developed country by 2047 (Viksit Bharat Sankalp, 2024) on a

low-carbon pathway leading to net zero by 2070. Its arsenal comprises an array of national- and state-level multi-sector action plans, an emergent and innovative industrial ecosystem, a population that is deeply mindful of nature and biodiversity, and a rich civilizational history of engineering, trade, and governance.

**»Arbitrary alterations to economic and industrial systems risk triggering degrowth and collapsing societal structures.«**

India's integrated climate action plans, initiated as early as 2008, cover areas such as clean energy transition and energy efficiency, sustainable water and agricultural systems, and natural resource conservation (PIB, 2021). These underscore that a high economic growth rate is essential to improve the quality of life and resilience of citizens, supported by novel institutional frameworks, resource allocations, and region-specific adaptation and mitigation measures involving local governments, public-private partnerships, and civil society.

India's renewable energy (RE) revolution, targeting 450 GW capacity by 2030, from 36 GW in 2015 (MNRE, 2024), has multi-pronged initiatives to engineer security, accessibility, affordability, and

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sustainability into its clean energy value chains. New institutions and regulations offer commercially viable project finance, cushion contracts, and offtake risks, ensure the must-run status of plants, and direct utilities to source a share of their power from renewables. Supply chain reforms include production-linked incentives of USD 3+ billion to manufacture ~48 GW of solar modules (MNRE, 2023), and mandates to integrate circularity via material recovery from solar waste (PIB, 2023).

The results are evident: India has the world's fourth largest solar and wind capacity (MNRE, 2024b), a ~118 GW market worth an estimated USD ~23 billion, and has raised its share of non-fossil fuel-based power capacity to 40%, with a new target of 50% by 2030. Together, 100 GW of solar and 60 GW of wind capacity (India has 75 GW of solar and 45 GW wind) could create 1.3 million direct and 3.3 million indirect jobs (Kuldeep & Ghosh, 2020).

A notable policy-behavior-market initiative to improve energy efficiency at scale is India's national mission to increase the use of LED bulbs over incandescent and CFL bulbs. The government procured high-quality LED bulbs from private com-

panies to guarantee economies of scale, which reduced the cost per bulb from USD ~3-4 in 2014 to less than USD 1 by 2017 (PIB, 2023b). As of March 2024, 368 billion LED bulbs had been marketed, extending productive hours in rural areas and improving urban street lighting, annually saving USD 2.3 billion in electricity costs and reducing 38 million tons of carbon dioxide emissions (UJALA, 2024).

In the Middle East, Saudi Arabia is employing a whole-of-ecosystem approach to combat extreme water scarcity. Its national strategy involves institutional, household, and industrial use reforms to optimize agricultural groundwater use and increase treated wastewater reuse while improving – rather than curtailing – water availability, affordability, and quality (MOJS-CEEW, 2023).

But even as EMDEs, many with vast populations, competing developmental demands, and limited resources, tenaciously leverage traditional knowhow, local resources, and domestic capacities to build sustainable systems for their socio-economic priorities, today's hyperconnected world needs multilateral collaboration to engineer sustainability into infrastructure, transport networks and global value chains.

For instance, ecologically and commercially viable product and service design and engineering will improve resource efficiency and minimize waste. Mobility and freight systems, the backbone of connectivity and enablers of prosperity are hard to abate sectors yielding ~9% of global CO<sub>2</sub> emissions (Shell-Deloitte, 2021), and need international solutions to ensure infrastructure availability, adopt clean energy, and manage demand-supply and financing gaps.

However, the bulk of finance and technologies critical for the intended scale and pace of the EMDEs' sustainable development is locked in developed countries. While G20 countries own a highly-skewed ~91% of environmental technology patents; even within this elite group, just five – China, Japan, USA, Korea, and Germany – hold ~85% of all patents granted to G20 countries between 2000 and 2021 (Gupta, Raha, & Mallya, 2023).

The international financial architecture has not created modern avenues to unlock capital flows for the trillions of dollars the EMDEs need for green transition (Stern & Stiglitz, 2023). Controversial metrics to promote climate-linked investments, such as Environmental, Social, and Governance (ESG) norms, have been “reduced to mere accounting tools, a way of balancing trade-offs instead of doing things differently” (Elkington, 2018).

The risk-averse, profit-oriented private sector is also yet to invest at scale in green sectors and technologies, with concerns about long-term project viability, the lack of risk mitigation mechanisms, and limited options for public-private financing and implementation models (CEEW, 2023).

### ENGINEERING SUSTAINABILITY INTO PROSPERITY

Gross Domestic Product (GDP), the prevalent economic production volume-based standard of prosperity, does not consider values such as quality, workmanship, sustainability, and desirability. Hence, our economic impetus has been on more (quantity), and not more and better (quantity and quality).

Compounding this problem is the impression that more is necessarily more

and wasteful, which arises from the history of developed countries prioritizing economic growth at any cost, massively exploiting fossil fuels, and indulging in rampant, linear, resource-intensive production and consumption.

To some extent, in the era before the climate crisis, there was no imperative or incentive to be mindful of carbon spaces and resource footprints. Developing countries, many of which were still buckled into colonial shackles, and some which had only just broken free, were specks in the economic rearview mirror. The crises of today were brewing, but there was little foresight – or even intent – to acknowledge these inconvenient truths.

Now that carbon space is almost depleted, resources are stressed, and the EMDEs have started asserting their rights and priorities in the global order, there is a rush to rewrite the rules of economic success. On one hand, there are legislations against excessive emissions and resource misuse, and on the other, efforts are ongoing to redefine prosperity beyond the numeric GDP, using subjective metrics such as well-being and happiness.

Such legislation and metrics tend to apply equally to all countries irrespective of their developmental stages and national circumstances. This matters because the developed countries must drastically alter their unsustainable trajectories to yield

## »We must embrace the alternative that sustainable prosperity is possible!«

space for the EMDEs to grow and flourish. But even as multilateral negotiations continue, **we must embrace the alternative that sustainable prosperity is possible!**

This perspective disrupts the prevalent narrative that living within planetary boundaries necessitates degrowth and deprivation. The India-led global initiative, Lifestyles for Environment (LiFE), which has inspired the G20 High-Level Principles for Lifestyles for Sustainable Development, promotes “mindful and deliberate utilization, instead of mindless and destructive consumption,” noting that consumption, by itself, is not the crisis (G20 Development Ministers, 2023).

The 2023 G20 New Delhi Leaders’ Declaration underscores the imperative to “decouple economic growth from environmental degradation.” Its Green Development Pact outlines opportunities to design and develop resource pathways, products, services, systems, and lifestyles that will sustain our future needs and wants (G20, 2023).

While there are many multilateral forums including the United Nations, the G20 is emerging as strategically agile. Till 2022, the G20 housed two-thirds of the global population and accounted for 85% of global GDP. With the inclusion, in 2023, of the 55-country, 1.4 billion people, USD 3 trillion GDP African Union (Munyati, 2023), the G20 has become exponentially larger and more diverse.

The G20’s socioeconomic reach and political heft enable its responsibility and capacity to shape a sustainable, resilient, and prosperous future. It can nudge the behaviors of people and countries towards sustainable options, create markets to serve these needs and wants, and influ-

ence its members’ policies to drive positive change at scale, globally.

This needs mapping macroeconomic risks caused by unsustainable growth and climate change at the global and country levels, including estimating the costs of inaction and planning transition pathways for core sectors such as agriculture, energy, industry, transport, and construction. Then, we must use this knowledge and consensus to map, source, and deploy the policies, tools, and capacity for each challenge by providing timely and affordable finance, clean technologies, and optimized resources.

We must rethink and rebuild our food, water, land, and air systems to be sustainably productive. The physical and digital infrastructure we create, even as we strengthen and preserve what we have, must be nature-friendly, resilient, and inclusive. Our energy and resource systems and transition pathways must be secure, clean, and equitable, with well-planned use and reuse, not misuse. Our trade and value chains, bringing us goods and services, must be designed to ensure that everything we produce and consume is useful and safe while minimizing resource wastage. We must follow our aspirations to inhabit inviting and serene spaces that improve our well-being and connections, supported by sustainable mobility and market systems.

Research and innovation are ongoing worldwide, some in collaboration, some in siloes, to achieve parts of this ambition. Rarer, however, is the genuine belief that we can have a cleaner, productive, inclusive, and prosperous future that is in sync with our natural world. The relentless harping on the ills and vagaries of the

day has drained us of humanity’s innate curiosity and capacity to imagine what we could build if we truly wanted it.

Our multilateral system, riddled with inadequacies and inequities, must be urgently reformed to rise, again, to its task of informing and inspiring our collective decisions and actions. Emerging influencers like the G20 must demonstrate the political will, public consensus, industrial capacity, and thought leadership to scope macro challenges and solve them at micro levels.

Above all, each of us must focus our thoughts and energies on the positive. We must open this historic window of opportunity to choose – and create – the future we want. We must utilize our scientific knowledge, traditional wisdom, and ability to innovate to engineer sustainability into prosperity. We must remember, and celebrate, that every economic choice is a lifestyle choice. Our choice.

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