Tea industry, pharma can build new kidney care research pipeline

TEA has long been woven into India's social and economic fabric. Now, its leaves may offer another, less familiar possibility: a source of molecules that could con-tribute to the future of kidney care. Derived from Camellia sinensis, tea contains a range of polyphenols, most notably epigallocatechin-3-gallate (EGCG), which has attracted growing scientific attention. Laboratory and experimental research suggests that these compounds possess antioxidant and anti-inflammatory properties—mechanisms that are relevant to kidney injury, where oxidative stress, in-flammation, fibrosis and metabolic damage can progressively impair renal func-tion.

The potential is particularly intriguing in diabetic kidney disease. Persistently ele-vated blood glucose can damage the kidney's delicate filtering apparatus, setting off inflammatory and cellular processes that may eventually lead to chronic kid-ney disease (CKD). Researchers are investigating whether tea-derived polyphenols can influence some of these pathways and potentially limit cellular injury and fibrosis. Similar questions are being explored in drug-induced kidney injury and other forms of renal damage.

Kidney stones offer another avenue of interest. Research has identified biological mechanisms that could help explain associations between tea consumption and a lower risk of urinary stone formation. But this is precisely where scientific enthu-siasm needs to be matched by restraint. An association between drinking tea and stone risk does not establish that tea—or a concentrated tea extract—can dissolve or treat an existing stone. That distinction points towards the real opportunity. The future may not be about selling tea as a "kidney medicine", but about identifying, standardising and de-veloping medically relevant molecules found in tea leaves.

For pharmaceutical and nutraceutical companies, this could mean purified com-pounds, standardised extracts or novel formulations. But each would have to clear the same demanding hurdles as any serious therapeutic candidate: toxicolo-gy, pharmacology, appropriate dosing, drug-interaction studies, well-designed human trials and regulatory scrutiny. This is especially important because tea should not be confused with established kidney therapies. Depending on the patient and stage of disease, evidence-based CKD management can include ACE inhibitors or ARBs, SGLT2 inhibitors and, for selected people with type 2 diabetes and CKD, treatments such as finerenone. No cup of tea can substitute for these interventions.

The proliferation of "kidney detox" teas makes the distinction even more urgent. Herbal products can interact with medicines or pose risks to people whose kid-neys are already compromised. A natural origin is not, by itself, evidence of safe-ty or efficacy.

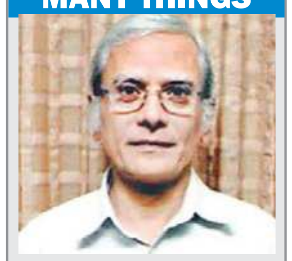
For tea-producing regions, however, the scientific opportunity is substantial. Lower-grade leaves, processing residues and other tea biomass could become feed stocks for extracting high-value bioactive compounds. That creates a poten-tial research-to-industry pipeline spanning extraction technologies, analytical standards, functional foods, nutraceuticals and, eventually, drug discovery. India's tea sector therefore has an opportunity to look beyond the cup. Universi-ties, tea producers, biotechnology companies and pharmaceutical researchers could collab-orate to determine which molecules merit investment—and which claims should be left behind.

The larger lesson is simple: tea may be more valuable to kidney medicine as a source of molecules than as a medicine itself. Turning that possibility into a ther-apeutic reality will demand patience, evidence and rigorous clinical validation. But with kidney disease becoming an ev-er-larger global health challenge, the humble tea leaf may deserve a much closer scientific look. Pharma and nutraceu-tical companies, tea growers and research scholars should come together and move towards this goal.

India's slums: From urban burden to economic asset

Their contribution to employment and informal economic activity makes community-led redevelopment critical

TALKING OF MANY THINGS



DR MOHAN KANDA

THE number of people living the five biggest slums, in the world, namely, Khayelitsha in Cape Town, in South Africa, Kibera in Nairobi, Kenya, Dharavi in Mumbai, India, Neza in Mexico and Orangi Town in Karachi Pakistan, according to one estimate, is 5.7 million. The figure for the world is estimated at about 900 millions. If different types of in-formal settlements are also taken into account, the number goes up to 1.6 billion, almost 1/4th of the world's urban population. By 2030, it is estimated that one in four people on the planet will live in a slum or other informal settlement.

Thanks to current trends in population growth and continuing migration from rural areas to cities, these slums are clearly here to stay and, for the first time in history, more people live in cities than in rural areas.

How slums are run depends on a variety of factors, such as their ethnic makeup, political connections, and how long they have been established.

India is home to a substantial proportion of the world's slum dwellers, and ad-dressing slum development is a crucial challenge for the country. Slums represent complex political and social issues which present formidable infrastructure and public welfare challenges. They function as major informal economic hubs that contribute significantly over 7.5% to India's total urban GDP, with their proximi-ty and affordability making for inexpensive housing close to commercial centres, allowing workers to minimize transit costs and sustain city commerce. They sup-ply low-cost labour essential for formal urban sectors, including construction, domestic help, transport, and waste management and constitute a substantial por-tion of the urban workforce and are, in fact, its backbone.

Some slums are incredibly productive. One area of Delhi, as a matter of fact, is referred to as a 'five-star slum', as it has running water, electricity, and other amenities.

Slums often house thousands of small manufacturing and recycling units. For ex-ample, Mumbai's Dharavi generates an estimated $1 billion annually through leather workshops, textile production, and pottery.

The central and the state governments, often with the help of charitable and NGOs, have launched major offensives to combat the challenge of the growth of slums. Well intentioned though such initiatives are, they have often been resist-ed, precisely by those for whose welfare they are meant, mostly on account of the selfish motives of vested interests such as local politicians. As witness the fact that older, more established slums, where residents have formed cohesive communities such as Dariba Kalan in the medieval city of Delhi, have erupted into riots in the face of government efforts to clear them, even though the government had offered to resettle the displaced people. Slums, such as those de-picted in 'Slumdog Millionaire', are complex communities with resi-dents of different income levels and are systems of political patronage.

Several factors contribute to the malady of the continuing growth of slums in In-dia, which can constitute a complex interplay of social, economic, and urban fac-tors. One, certainly, is the significant influx of people from rural areas to urban centres in search of better economic opportunities, which results in a rapid in-crease in the urban population, often overwhelming cities' ability to provide housing and basic services. As real estate prices in cities are often prohibitively high for low-income individuals and families, they settle in informal settle-ments. Poor urban planning and insufficient investment in urban infra also con-tribute to the growth of slums. Slum dwellers often work in low-paying, informal sector jobs, the only employment opportunities available to them.

Slum development is important on account of its wide-ranging implications for social, economic, and urban development. As slums are often home to some of the most economically disadvantaged popu-lations, provision of better living conditions, access to basic services, and eco-nomic opportunities, slum development can contribute to poverty reduction and improved living standards. It also promotes social equity and inclusivity, ensur-ing that marginalized and vulnerable populations have access to decent housing, clean water, sanitation, education, and healthcare, thus reducing social dispari-ties, the spread of diseases and enhancing the overall well-being of slum resi-dents. Improved living conditions and economic opportunities can lead to re-duced crime and violence in slum areas, enhancing the safety and security of res-idents. Limited access to basic amenities and financial instability keeps many slum children out of school, pushing them into child labour, stunting long-term human capital growth

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Slum development in India is a complex and multifaceted challenge, with several significant obstacles to overcome.

For one thing, slums are often densely populated, leading to overcrowding and inadequate living space. This overpopulation can strain already limited resources and infrastructure. Also, relocating slum requires finding suitable land, ad-dressing resistance from the affected communities. It often calls for the ability to navigate complex bureaucratic processes and overcome political challenges, which can slow down progress and result in corruption. The process requires the communi-ty's active participation in governance and planning in the decision-making pro-cess as, without it, development efforts may not meet their needs.

Many NGOs, such as the Mahila Housing Trust, in India are involved in initia-tives for slum development and play a vital role in addressing the multifaceted challenges faced by slum dwellers. Many of them work to provide affordable and improved housing for slum dwellers, in addition to engaging in building or ren-ovating homes and ensuring access to basic amenities like clean water sanitation and hygiene facilities. Some also run vocational training and skill development programs to equip slum residents with the skills needed for better employment opportunities. Many focus on empowering women through self-help groups, in-come-generating activities, and training programs to improve their socio-economic status.

They also engage in advocacy efforts to raise awareness about the rights and needs of slum dwellers. Some of them even offer micro-lending services and fa-cilitate access to credit for individuals and small businesses in slum areas, pro-mot-ing financial inclusion. Other areas where NGOs do commendable work in-clude sanitation and hygiene promotion, environmental sustainability and disas-ter response. NGOs often act as intermediaries between slum residents and gov-ern-ment programs, helping people to participate in governance and planning ac-cess to benefits and services they may be entitled to.The urban agglomeration comprising the cities of Warangal, Hanamkonda and Kazipet is home to over 200 slum settlements, many of them unrecognised.

Children living in them face multiple and overlapping disadvantages. Pov-erty, insecure livelihoods, migration, poor housing, inadequate sanitation, inter-rupted schooling, child labour, substance abuse, and limited access to govern-ment services combine to create an environment where children remain highly vulnerable to exploitation and exclusion.

Don Bosco Navajeevan (DBNJ), a well-known NGO, has been working in some of the slum communities, through integrated interventions in education, child protection, health, nutrition, mental health, family strengthening, adolescent lead-ership, and community mobilisation. Its experience has shown that there are many challenges in addressing urban poverty. It is a phenomenon that cannot be ad-dressed through isolated interventions.

Investment in urban slums should move beyond infrastructure and adopt community-based development approach that empowers residents to become ac-tive partners in planning and managing their own development.

Most families in slums survive on daily wage labour and other informal occupa-tions with unstable incomes. A significant proportion of households are migrant families whose mobility often disrupts children's education and access to welfare servic-es. Housing conditions remain inadequate, with many families liv-ing in temporary or semi-permanent structures lacking proper sanitation and drainage. Although government schools are available, many children continue to experience learning gaps, irregular attendance, and a risk of dropping out due to economic hardship and family responsibilities.

Sustainable change is possible only when families, communities, govern-ment institutions, and development partners work together. The existence of slums is a matter of shame to any country, particularly for a country like India, which claims to be fast approaching the acquisition of the status of a $5 trillion econo-my, the fourth largest in the world. While, undoubted-ly, many laudable steps have been taken to address and overcome the challenge, there is much that re-mains to be done. Grave and solemn though the challenge is, there are those who treat the is-sue with indifference if not contempt. It is not unknown for people to include in their walk-ing, whether for pleasure or as a form of exercise, a visit to the slums, thus combining the need for exercise with the satisfaction of being able to claim their hav-ing rubbed shoulders with those living in abject poverty.

(The writer was formerly Chief Secretary, Government of Andhra Pradesh)

Why E1 lies at the heart of Britain's West Bank trade ban

Settlement project could reshape the geography of the occupied territory

RORY MCCARTHY

ISRAEL has been building settlements in the occupied West Bank for decades. But Britain's new ban on the import of settlement goods comes in a response to a major escalation in construction over the past four years, which an International Court of Justice advisory opinion in 2024 concluded is illegal and must stop.

Most striking are recent steps to build a new settlement bloc known as E1 on the outskirts of Jerusalem. First planned as long ago as 1999, but progressing significantly over the past year or so, the E1 bloc would mark a major change to the geography of the West Bank. Current plans allow for thousands of housing units in the settlement, as well as commercial properties and regional services. The project would establish a new urban area that would connect the large settlement of Maale Adumim with East Jerusalem.

The international community has long seen the construction of E1 as a red line for three main reasons. First, it would isolate East Jerusalem from the rest of the West Bank, including major Palestinian cities like Ramallah and Bethlehem. This matters because East Jerusalem is the proposed capital of a Palestinian state in any future two-state agreement to end the conflict.

Second, because E1 reaches across the West Bank at its narrowest point, it would also disrupt the connections between the north and south of the territory. Fragmenting the West Bank in this way would again undermine efforts to develop a future Palestine state.

> The E1 project has advanced considerably in recent times, after years of delay. In August 2025, final planning approval was given for more than 3,400 housing units on the site. Then, in August 2026, the first call for construction tenders was issued to build 1,200 residential units in the southern part of E1

And third, the construction of E1 would involve the displacement of Palestinians. This includes people in the community of Khan al-Ahmar, which Israeli authorities ordered should be evacuated in May 2026 ahead of the new settlement construction.

Israeli government ministers have been explicit that E1 would suffocate any future Palestinian state. In September 2025, when announcing new progress on E1, Prime Minister Benjamin Netanyahu said: "We are going to fulfil our promise that there will be no Palestinian state." His finance minister, Bezalel Smotrich, has also said E1 would "bury the idea of a Palestinian state".

The E1 project has advanced considerably in recent times, after years of delay. In August 2025, final planning approval was given for more than 3,400 housing units on the site. Then, in August 2026, the first call for construction tenders was issued to build 1,200 residential units in the southern part of E1. The closing date for bidding is on October 19, just before Israeli elections on October 27.

The UK's import ban, which seems intended to deter companies from taking part in building E1, has been backed by similar measures announced by countries including Canada, France, Ireland and Spain.

Mounting international concern

The ban on settlement goods demonstrates mounting international concern about Israel's actions. More than 700,000 Israeli settlers now live on land captured in the 1967 six-day war, even though settlements on occupied land are illegal under international law.

Israeli rights group, Peace Now, reports that more than 102 new settlements have been approved since 2022, most deep inside the West Bank. The Israeli military often supports settlers building new outposts, and the Israeli government provides substantial financial backing to establish settlements.

The UN says that more than 6,400 Palestinians have been displaced in the West Bank due to settler attacks and access restrictions since January 2023, of which at least 2,500 were displaced in 2026 alone.

In addition, more than 30,000 Palestinians have been displaced from refugee camps during Israeli military operations in the northern West Bank since late 2024. Israel's expanded control over the West Bank is one element in a broader revisionist policy to push its borders outwards, which marks a step change from a previous strategy of conflict management.

The new moves come in the wake of the October 2023 attacks, when Hamas gunmen killed more than 1,200 Israelis and captured 250 hostages, and Israel's subsequent war in Gaza, which has killed more than 70,000 Palestinians and devastated the strip. Since the war began, Israel has seized territory as a buffer zone in southern Lebanon against Hezbollah. It has also advanced into Syria, following the fall of the Bashar al-Assad regime in late 2024. In Gaza, Israel has now taken control of at least 60 per cent of the strip and is considering building three new military settlements there.

Israel's far-right national security minister, Itamar Ben-Gvir, recently again raised the prospect that Israel may seek to expel the 2 million Palestinians in Gaza. Egypt, which has a border with Gaza, and Jordan, which shares a border with the West Bank, are gravely concerned about the risk of mass deportation of Palestinians across their borders.

The UK government's action against settlement expansion, accompanied by similar measures introduced by countries elsewhere, signals a new effort to curb these expansionist ambitions.

(The writer is an Associate Professor at Durham University, England)

Manufacturing holds key to India's $30 trillion economy dream

Sector seen as critical for jobs, exports, innovation and productivity gains

VINCENT FERNANDES

INDIA's journey towards becoming a $30 trillion economy by 2047 will require the manufacturing sector to play a critical role in this transformation. Currently, manufacturing accounts for 17.5% of the country's gross value added (GVA), with the Indian government having set out a target to increase this share. As a major employment generator, the sector supported 1.85 crore jobs in fiscal 2022, making it crucial for a youthful India where the average age is currently 28 years. To translate this demographic profile into broad-based prosperity, the share of manufacturing in gross domestic product (GDP) needs to rise. Manufacturing can absorb labour at scale across diverse skill levels, create stable and formal jobs, and lift productivity through better processes and technologies.

Manufacturing expands employment by establishing large, formal operations and deep supplier networks that create roles across production, quality, maintenance, logistics, and business services; capacity additions bring structured hiring and skilling pathways that move more workers into higher productivity positions. By standardizing processes, investing in equipment and automation, and achieving scale efficiencies, firms raise value added per worker—broadening income through export participation and stronger domestic linkages, and thereby supporting gains in per capita GDP.

Continuous product and process development on the shop floor—underpinned by advances in design, tooling, and digital and advanced manufacturing technologies—and supplier development within clusters foster R&D and innovation, accelerating technology diffusion and capability building across the ecosystem. In India, a robust manufacturing sector is essential for enhancing the country's competitiveness in global markets. It plays a vital role in increasing exports and reducing reliance on imports, thereby contributing to a favorable trade balance. The Indian government has recognized the importance of manufacturing and aimed to improve India's manufacturing competitiveness with a host of measures outlined in the later section, with the aim to transform the country into a global manufacturing hub. By strengthening manufacturing capabilities, India can achieve sustainable economic growth and improve its position in the global supply chain.

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Manufacturing not only drives investment, innovation and exports, but also creates quality employment, raises productivity and strengthens linkages across multiple sectors of the economy. For a country like India, with a young workforce and a median age of around 28 years, a vibrant manufacturing sector offers the most effective pathway to harnessing its demographic dividend and translating it into broad-based and inclusive prosperity.

India's manufacturing sector today accounts for nearly 17 percent of Gross Value Added, a share that has remained broadly stable over the past two decades. During the same period, several economies have significantly expanded their manufacturing capabilities and strengthened their integration with global value chains.

From an initial universe of 62 sectors, a transparent relative-attractiveness methodology has identified twelve in which India can realistically aspire to global leadership: Electronics, Telecom Equipment, Solar PV, Pharmaceuticals, Chemicals, Automobiles, Defence and Drones, Steel, Capital Goods, Textiles, Food Processing, and Leather and Footwear. Each has been examined through the lenses of strategic alignment, financial viability, and value-chain positioning, and benchmarked against the nations that have achieved demonstrable excellence in the respective domain. The intent throughout has been to ground aspiration in analytical rigor, so that the choices before us rest on evidence rather than on assertion.

The country must progressively move up the value chain, build globally competitive enterprises, strengthen domestic capabilities in advanced manufacturing, and integrate more deeply into global production networks. Self-reliance, export competitiveness, technological leadership and employment generation are not competing priorities; rather, they reinforce one another and together form the foundation of a resilient, competitive and future-ready manufacturing economy.

Realizing this vision will require sustained collaboration between the Union and State Governments, industry, academia, financial institutions and the wider innovation ecosystem. It will also require policy continuity, institutional coordination and a shared commitment to strengthening India's manufacturing capabilities over the long-term.

"A strategic roadmap is meaningful only if it provides a basis for informed decision-making and effective implementation. This report has therefore been prepared not merely as an assessment of India's manufacturing landscape, but as a framework for identifying the sectors that should receive strategic attention and the interventions required to strengthen their competitiveness. It examines each sector through the lens of India's comparative advantages, emerging global opportunities and existing structural constraints. The objective is to support evidence-based prioritization, so that policy efforts, public investment and private capital are directed towards areas that offer the greatest potential for enhancing productivity, expanding manufacturing capabilities, creating employment and increasing India's participation in global value chains. In doing so, the report seeks to move the discussion from broad strategic intent to a more focused and implementable sectoral roadmap.