

# The lure of floating solar plants

Water is emerging as the new land for solar plants in India, and around the world



VANDANA GOMBAR

The concept is simple. Since large parcels of land are not easy to acquire, or are just not available in some countries (think Bangladesh, Japan or Singapore), why not use the real estate presented by water bodies to set up floating solar plants. This technology has given four advantages.

These are that the water has a cooling effect on the system and therefore may increase generation, that the existing transmission infrastructure of the reservoir can be put to good use, that evaporation of a scarce resource like water can be prevented, and that knotty people displacement issues can be avoided. To top that, the cost of floating solar is coming down fast.

According to Xiao Fuqin, deputy general manager at Sungrow Floating, a unit of Sungrow Power, floating solar costs have fallen by 44 per cent over the last two years. He was speaking at a conference in Shanghai earlier this month.

NTPC has plans for several hundred megawatts of floating solar plants in the country, and aims to take a lead in the sector.

In November last year, Shapoorji Pallonji Group bagged 50 megawatts in

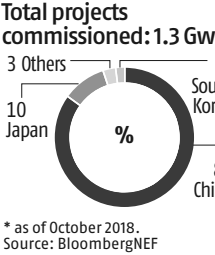
the floating solar auction on the Rihand reservoir in Uttar Pradesh by the state-run Solar Energy Corp of India at a tariff of ₹3.29 per unit.

Last week, Singapore sought proposals for a 50 megawatts plant that “will be one of the largest single floating solar PV systems in the world when it is completed.”

Norway’s biggest utility, Statkraft, began construction of its first floating solar plant earlier this year, in Albania, and is currently scouting for project opportunities in India. A competitive tariff remains the key consideration, however.

Kerala State Electricity Board (KSEB) has an operational 0.5 megawatts floating plant in the reservoir contained by the Banasura Sagar dam that survived the 2018 floods. It stands on a hollow ferro-cement floater that almost replicates land on water — no ripples are felt on the platform — though its high cost would prevent it from becoming the platform of choice for new plants.

## FLOATING SOLAR INSTALLATIONS\*



There are over 1.3 gigawatts of floating solar plants globally, according to BloombergNEF. China leads installations, though India is expected to become another of the big four markets.

In Chile, a small floating solar plant has been installed by Anglo American on top of the tailings dam that holds liquid waste from copper mining operations. Thermal power generation companies with reservoirs at the plant site are also looking at the option of using the surface area of the water to generate power.

It is possible that floating solar ends up becoming cheaper than ground-mounted solar. KSEB’s executive engi-

neer, Ayyub Kunnanolli, was confident that it would be so: “Land cost will go up as availability goes down. Float cost will (ultimately) become lower than land cost.”

The Solar Energy Corporation of India has issued a tender for a 20 megawatts of floating solar plants, with 60 megawatt-hours of storage, spread across 11 Lakshadweep islands. The closing date has been extended to August 5, 2019.

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# 5G’s multiple conundrums

Limited availability and high prices may deter telcos, but 4G may no longer be adequate for meeting customer needs

SURAJEET DAS GUPTA

First the good news. Last week, newly-appointed communications minister Ravi Shankar Prasad pushed the pedal on 5G and made two announcements: permission for the long-delayed trial runs by telcos will be given in 100 days; and, the much-anticipated sale of spectrum, which would include 5G spectrum, will be conducted this year.

But here’s the not-so-good news: Telecom operators, reeling under ₹500,000 crore of debt are not all that enthusiastic about buying 5G spectrum principally on account of limited availability and unaffordable pricing.

where margins for telcos will be very low. So where is the business case,” Matthew points out.

Operators will have to pay over ₹50,000 crore to get all India 5G spectrum in this band, and they with infrastructure providers might have to invest \$25-30 billion to build a pan Indian network, increase tower density and convert microwave backbone of towers with fibre. There are other bands such as 2,600-2,800 for which infrastructure to support 5G is proliferating, but it is not in Trai’s list for auction.

Vodafone-Idea has publicly stated that it wants auctions to be pushed beyond 2020, as they are busy rolling out 4G now after the merger. And Airtel has made it clear it will mainly be interested in picking up 4G spectrum and will look at 5G only if prices are reasonable.

Telcos say for most mobile customers 4G is enough for her needs, such as watching movies, downloading videos or gaming. The number of subscribers who want to see augmented and virtual reality content that will require 5G spectrum is very limited in India. Plus, 5G phones cost a whooper at \$1,000 currently, which is likely to deter India’s innately cost-conscious customers.

At the same time, it is also true that 4G data quality is deteriorating with increased usage. A study by Ericsson points out that as much as 60 per cent of mobile consumers in India on smart phones in metros are facing congestion (in other cities, it is 50 per cent). With the huge data explosion, 60 per cent of the 4G spectrum has been used



DISCONNECTED A study by Ericsson points out that as much as 60 per cent of mobile consumers in India on smart phones in metros are facing congestion

already. Surely getting substantial chunks of 5G spectrum with large bandwidths between 25 MHz and 100 MHz could ease the congestion. That apart, says Ericsson’s Thomas Noren, head of 5G commercialisation at Ericsson: “The other plus is that operating cost of delivering one gigabits of data in 5G is one tenth of that of 4G, a large cost advantage.”

There is another valid reason to use 5G: it could power enhanced mobile broadband at homes, where the last mile is wireless. That is much cheaper and faster to deploy than fibre-to-home broadband, a route Reliance Jio has taken with cumbersome delays in getting right-of-way to lay down fibre lines. Of course, the jury is still out as to which is a better route in the long term. But the domination of broadband at home

is clearly the next big battle for which Jio and Airtel are readying.

5G, with its low latency, offers myriad of new opportunities for revenue generation, such as remote robotic surgery, scanning millions of faces in the airport for security, or enabling smart cities by helping to connect a millions of devices together in one go. But says a senior executive of a leading telco: “But it would take at least three to five years for these test cases, which we have displayed at exhibitions, to be commercialised and for telcos to make substantial revenues. So why should we sit on spectrum for so long?”

Matthew says that the focus of the auction for government might be 5G, but without a sharp decrease in price, the focus for telcos would be to grab more 4G spectrum (50-75 Mhz will be avail-

able) in order to augment their capacity in metros and cities to combat congestion. This means that the government could well face the spectre of unsold 5G spectrum. Until of course Reliance Jio which has kept in the background changes the dynamics.

However, if 5G prices are cut, some incumbent operators might roll out limited 5G services in key cities such as Mumbai and Delhi and offer a high-speed, no-congestion service at a premium. Or they could use the spectrum to launch limited enhanced mobile broadband services for customers in the larger cities where laying fibre in the last mile is a challenge.

All in all, the future of 5G in India will depend on how the government chooses to structure its first 5G spectrum sale.



## INSIGHT

# Effects of the US-China tariff escalation



ANIRUDH SHINGAL

In the last one year, the US has imposed tariffs worth \$250 billion on Chinese imports and China has retaliated by covering US imports worth \$110 billion under higher tariffs. It began with the imposition of safeguard tariffs by the US on imports of solar panels and washing machines in January 2018 following USITC findings on injury to US industry in October 2017 under Section 201 of the 1974 Trade Act. This was followed by US President Donald Trump’s announcement to impose 25 per cent tariff on steel and 10 per cent tariff on aluminum on all trading partners on national security grounds under the seldom-used Section 232 of the 1962 Trade Expansion Act. These tariffs came into effect in March 2018. Canada, Mexico, the European Union, South Korea, Brazil, Argentina, and Australia were initially exempted from the steel and aluminum tariffs, but the exemptions ended in June 2018.

This led to a flurry of retaliatory tariffs on US exports imposed by China, the EU, Canada and Turkey. In fact, Harley-Davidson announced on June 25, 2018, that it was shifting additional motorcycle production

outside the United States to avoid the retaliatory tariffs.

Before 2018, average US tariffs on Chinese imports were 3 per cent compared to average Chinese tariffs on US imports of 8 per cent. Post the tariff escalation on either side, the average tariffs have increased to 12 per cent and 20 per cent respectively. Thus, both countries are suffering the costs of applying higher tariffs. One immediate fallout of tariff imposition is the wedge between the prices that producers receive and the prices that consumers pay in the importing countries. Recent academic research on this subject suggests that importers in both the countries have borne most of the tariff incidence imposed in 2018 and there have been few terms of trade gains from these tariffs. Another study from the Peterson Institute of International Economics (PIIE) finds that Trump tariffs have raised steel prices by 9 per cent, creating 8,700 jobs in the US steel industry, but steel users pay an extra \$650,000 for each job created.

Note that tariff costs get inflated in a world of global value chains (GVCs) as firms import intermediate inputs, add value, export semi-finished products for another (multiple) layer(s) of value addition leading to the final product, with each cross-border flow of goods entailing tariff costs. Significantly, the bulk of US tariffs on China have been imposed on intermediate goods, which have a greater adverse effect on firms, including in the US, that are large and steady importers of Chinese intermediate

inputs. In contrast, China has been wary of not hurting its own supply chains as most of its own tariffs on US imports are imposed on consumer goods. Even so, this tariff escalation has rendered GVC-integration challenging not just for these two countries but also for their significant GVC-trading partners. In the case of China, for instance, eight of its top 10 GVC-trading partners are based in South-East Asia, which paves the way for regional spillover effects.

These trade wars have also caused political risks and uncertainty, which coupled with the stagnation in growth of GVCs, have also led to an adverse effect on foreign direct investment (FDI), as also acknowledged by UNCTAD’s 2017 World Investment Report. In fact, global FDI flow fell by 23 per cent in 2017 relative to 2016 with both cross-border M&As and announced greenfield investment projects witnessing significant double-digit declines in the respective year-on-year growth rates.

But there are other important indirect fallouts. The imposition of steel and aluminum tariffs on national security grounds has seriously undermined the multilateral trading system and set a dangerous precedent that other WTO members can follow. This can be particularly problematic for less developed and small and poor developing countries whose trade-related development concerns have so far been sought to be addressed via the WTO. In fact, some other PIIE research suggests that Trump’s steel tariffs have had a disproportionately adverse effect on small and poor

countries that have seen a 12 per cent decline in steel export volumes to the US and 15.5 per cent less revenue, compared to the six months preceding the tariffs, even as strong economic growth actually increased US imports of steel by 2.2 per cent. Ironically, had these tariffs been imposed under Section 201 of the 1974 Trade Act, that is, on grounds of injury to US domestic industry instead of for national security reasons, small and poor countries would have been automatically exempted as their exports would not have been large enough to hurt US domestic industry.

What is likely to happen next? Initial reports suggest that the tariffs imposed during 2018 are likely to stay even in the event of a successful deal between these two economies, which suggests a new higher-cost equilibrium for global trade. Some actions of the past year such as imposition of steel and aluminum tariffs on national security grounds and renegotiating past trade agreements like NAFTA are clearly Trump-specific (POTUS has scant respect for rules of the game) and are likely to erode the US’ credibility in international policy-making. However, other measures are consistent with broader US policy (even the Obama regime blocked appointment of WTO appellate body members; concerns about Chinese export subsidies to state-owned enterprises and the undervalued Chinese currency have preceded Trump). It would have been much better if Trump had used the US’ clout and built relationship with allies to address such concerns rather than alienating US’ important trading partners and allies via tariffs.

The author is senior fellow, ICRIER

## LETTERS

### Illogical opposition

Apropos your editorial “Digital tax breakthrough” (June 11), however long and arduous the road to a common tax code may be, it is a goal well worth pursuing. Of course, there will be several hurdles but then, all good reforms face those. The biggest rogue — USA — is expectedly against the move. Not only does the giant stands, the they must disagree with anything that everyone else in the world thinks is good. We are already witness to his illogical opposition to efforts for containing climate change and now, he will find another reform to disagree with. Notwithstanding the US’ opposition, the UK and France and others must do their best to push it through.

To see that our trillion dollar m-cap companies like Amazon, Apple, Google and others are getting richer by avoiding taxes through means not entirely kosher is certainly not a comforting thought. These mega conglomerates already have the world — minus China — in their grips and they will continue to make the hold tighter as they become obscenely richer. This must stop. They must pay taxes where their revenue is generated and not merely where their notional regional headquarters are located.

The 2020 deadline certainly seems unrealistic; but the work on achieving a consensus must continue. Even if the common tax code comes into practice five years later, it would still be well worth the wait. I would go to the extent of sug-

gesting that India, China, Russia and other nations over-protective about storage of data collected from their citizens within their national borders must relent on their stand for the specific objective of making the G20 communicate a reality.

**Krishan Kalra** Gurugram

### A true liberal

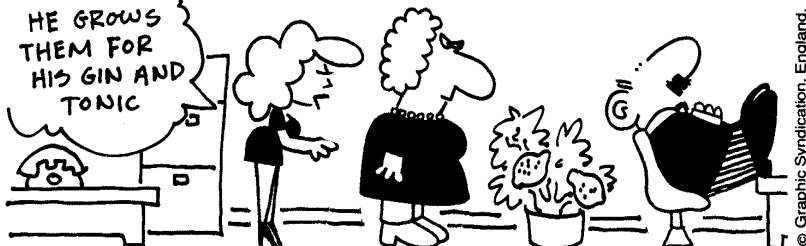
In the passing away of actor, author, filmmaker and playwright, Girish Karnad (*pictured*), Karnataka has lost a colossus. His plays like Tughlaq, Hayavadana, Naga-

Mandala, Tale-Danda and many others are recognised as one of the main pillars of the Nayya literary movement. Never afraid of holding up a mirror to the society, the ‘Urban Naxal’ stood for every cause that could be considered liberal. True to his wishes, he was cremated with a simple ceremony sans rituals and a state funeral. His death is a huge loss to the world of modern Indian theatre and literature.

**N J Ravi Chander** Bengaluru

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## HAMBONE





## A shift eastward

But Bimstec and Saarc need not be exclusive of each other

What can be discerned about the second Narendra Modi-led government's foreign policy, and how might it differ from the first? The initial signs are encouraging. The last government was sworn in in the presence of leaders of the countries of the South Asian Association for Regional Cooperation (Saarc). But this year, the swearing in was observed by the leaders of a different regional grouping: The Bay of Bengal Initiative for Multi Sectoral Technical and Economic Cooperation (Bimstec). This grouping, headquartered in Dhaka, includes Bangladesh, India, Myanmar, Sri Lanka, Thailand, Nepal and Bhutan. The leaders of the Mauritius and Kyrgyzstan were also invited. This is a slight shift from the first term's initial emphasis, and reflects some of the learning from the first term. In particular, the confrontation with Pakistan earlier this year will have changed the calculus for New Delhi, although the shift away from Saarc could perhaps be dated to the Uri attack in September 2016. The government's priorities were underlined by Prime Minister Narendra Modi's trip to the Maldives and Sri Lanka. A day earlier, the new foreign minister, S Jaishankar, travelled northeast, to the Kingdom of Bhutan, for his first overseas visit. Between the two of them, the focus of India's neighbourhood policy was unmistakable.

Mr Jaishankar, speaking during his first major policy discussion since he took office, said that Bimstec was "full of energy", as distinct from the problematic Saarc grouping. He also indicated a major and welcome principle for India's relations with its neighbours: "We need to incentivise cooperation in the neighbourhood by stepping out ourselves. The one thing in this domain that I would not like to see is that it has to be somehow reciprocal." In other words, the foreign minister is clearly stating that India will have to take the lead, if necessary unilaterally, in improving and firming up relations with its neighbours, particularly to the east. This is a vitally important perspective. Any rising power such as India must ensure that its neighbours are supportive of its quest for growth, or that quest may constantly be held back by numerous little irritants. The best way to ensure their cooperation is to move beyond a transactional relation with the neighbours and ensure that they are in a position to profit from the shared growth of the region. Operationally, the government will now have to ensure that pan-Bimstec plans such as transit permission for commercial vehicles get put into place at the earliest. A greater commitment to timely delivery of promises on infrastructure development is also needed in this term.

The government's focus on Bimstec is understandable, and the principle of unilateral leadership is also a very important one. However, it would be unwise and premature to abandon hopes for Saarc. Investment in both of the groupings is possible — one does not cancel out the other. It is true that Indo-Pakistan relations have always bedevilled Saarc. But it is also true that Saarc is the stepping stone to Central Asia, another area — just like Southeast Asia — where India can hope to play a role and to build partnerships for growth. Any opportunity to breathe new life into Saarc, in spite of the troubled bilateral relationship, should not be disdained.

## Ambitious move

The challenges before the Jal Shakti ministry are huge

As the chosen one for the newly-minted Jal Shakti Ministry, Gajendra Singh Shekhawat has one of the toughest jobs in the second edition of the Narendra Modi government. Apart from the responsibility of rolling out the government's ambitious plans to provide piped water connections — the *nal se jal* scheme — to every household in India by 2024, Mr Shekhawat will also have to address international and inter-state water disputes and the Namami Gange project — the flagship initiative to clean the river Ganga, its tributaries and sub-tributaries. This is in line with the BJP's election manifesto, which promises to address water-related issues in the country in an integrated manner.

The idea behind the creation of the ministry is salutary because it has the potential of bringing about a transformational change. A NITI Aayog report in 2018 noted that around 600 million people in India face high-to-extreme water stress. Around 75 per cent of the households do not have drinking water on their premises, 84 per cent rural households do not get piped water, and 200,000 die every year because of inadequate access to safe water. With 70 per cent of the water contaminated, India holds the dubious position of 120th among 122 countries on the water quality index.

Around 21 cities, including New Delhi, Bengaluru, Chennai, and Hyderabad, are set to run out of groundwater by 2020, affecting an estimated 100 million people. By 2020, India will be formally categorised as a "water-stressed" country, where per capita availability of water is less than 1,000 cubic metres. And by 2030, water demand is expected to be twice the available supply and the country could lose up to 6 per cent of its gross domestic product.

One of the main reasons for this crisis is that India's river systems are suffering badly from water scarcity. Take the example of the river Yamuna — the largest tributary of the river Ganga in North India. The river was once described as the lifeline of Delhi. But today, it has become one of the dirtiest rivers in the country. According to the Central Pollution Control Board, the water quality of the Yamuna is fit only for recreation and industrial cooling, completely ruling out the possibility for underwater life.

Agriculture is another issue. India has 18 per cent of the world's population with 4 per cent of the world's fresh water. Of this, 80 per cent is used in agriculture. India's farmers prefer water-guzzling crops like rice, cotton, wheat and sugarcane. Rice, an important export crop, consumes as much as 3,500 litres of water for a kilogram of grain. But convincing farmers to cultivate other crops would be a tough job.

India's annual rainfall is mostly received between July and September. In the absence of storage procedure, lack of adequate infrastructure, and inappropriate water management, around 20 per cent of the water is used. An exclusive water ministry at the Centre also has to face more than just the water challenge. Infrastructure, which is critical to the distribution of piped water, is in a shambles in rural India. It needs to be rebuilt along modern lines. Besides, water is a state subject, and in most states, lakes and ponds have been altered for urbanisation and industrialisation. The water mafias, real estate lobby and even farmers will loathe any Central intervention. The only way the Centre can intervene is through inter-state rivers if Parliament legislates it in the public interest.

ILLUSTRATION: BINAY SINHA



## Technology will drive the new Cold War

It is now the currency of power — one with ominous implications for India

The US and China are locked in a sharpening strategic confrontation that is likely to dominate international relations for the foreseeable future. There may well be phases of remission just as there had been in the Cold War of the previous century between the US and Soviet Union but these will be tactical and temporary. The rivalry will not be played out in military and ideological terms only as in the previous Cold War. The new Cold War will be centred on mastery of technology as the currency of power.

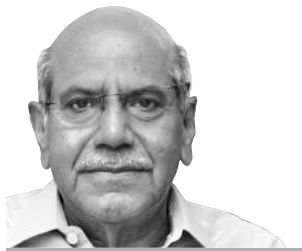
The US is currently engaged in constructing a range of technology denial measures against China and is mobilising its allies and friends to do the same. This is not easy since China is embedded in a densely inter-connected global economy and is part of several critical supply chains which cannot be unravelled in a hurry. Over the past two decades, China has been engaged in a large scale and systematic effort to acquire, adopt and assimilate advanced technologies from Western countries, in particular the US. Since embarking on its reform and liberalisation policy in 1978, it has been able to send several hundred thousand Chinese to study in top Western institutions, bringing back to the country a formidable pool of knowledge. This has served as the foundation for China's transformation from a technology seeker to a technology generator. This has not only enabled China to sustain a high rate of economic growth over the past four decades but has enabled it to build a modern and technologically sophisticated military machine. While US actions may slow down China's accumulation of power, a reversal is unlikely unless domestic political disruption intervenes. This appears unlikely given the fact that technological capabilities

now extend to mass surveillance and virtually instant response to domestic security threats.

China's response to denial of technology has been "doubling down on indigenous innovation and developing "core technologies" which are precisely the domains identified in the China 2025 plan and include IT, machine learning, quantum computing and artificial intelligence (AI). At present, China lags behind in semi-conductors and imported \$300 billion worth in 2018. Now huge investments have been announced in this sector, estimated at \$100-150 billion in public and private funds over the next few years. Major Chinese firms like Baidu, Alibaba and Huawei have been working to design and produce their own microchips. Alibaba launched its own semi-conductor division, Pingtoug, in September last year to develop AI chips for cloud computing and internet connected devices. Huawei will spend \$300 million each year over the next five years to design and produce new generation chips. It unveiled a 7nm microchip in August last year. China is ahead of the US, in quantum computing and as of 2017

had filed twice as many patents as US companies. Taking advantage of having a massive pool of citizens' data, with no concerns over privacy, China has accorded the highest priority to developing its capabilities in AI. Its Next Generation Artificial Intelligence Development Plan seeks to make the country the world leader in AI and associated technologies by 2030. Chinese overall spending on R&D was \$376 billion in 2015, as compared to \$13 billion in 1991 and exceeded the R&D expenditure of Japan, Germany and South Korea combined.

Technology is also at the centre of China's military strategy. One key feature is that over the past two



SHYAM SARAN

## A new India

Economic systems can be broadly classified between market and non-market. A market system is one in which the market freely trades resources such as time, effort, land, materials, capital and energy, allowing these resources to be appropriately priced and be converted into usable things or services. Market systems have succeeded because they are efficient in allocating resources and generating maximum possible wealth. However, markets can be unfair. They invariably lead to wealth concentration since random outcomes are an important ingredient in outcomes.

This doesn't mean that non-market systems, where governments determine results, have been better because they are woefully inefficient. Contrary to popular discourse, non-market systems are also almost always unfair since they concentrate power and resources in a few hands. Given the greater efficiency of a market system, it is almost the choice du jour to run economies.

The question then is: Can we make market systems fair? This issue of lack of fairness of markets became stark in the aftermath of the Great Depression in the US in the 1930s, and gave birth to a revolutionary thought process by one of the brightest economists of the past 100 years, Kenneth Arrow. He argued that we could make markets fair by adjusting the starting position without altering their efficiency for worse. Arrow's theory proposed that governments collect taxes from rich people and distribute some of that money to poor people via subsidy programmes. This "head start" strategy neutralises the role of random positive outcomes in market systems, giving the left out or disadvantaged people a chance to compete. Kenneth Arrow won a Noble Prize for this theory.

As appealing as Kenneth Arrow's theory was, putting it in practice has proved challenging. Governments are neither good at collecting taxes nor at distributing subsidies — especially in poor countries. Corruption at all levels makes fairness very difficult

to deliver. So while India has pursued the Kenneth Arrow model, the results have been far from satisfactory. India's subsidies have totalled around \$500 billion over the past 30 years with a limited impact on poverty. The key reason is the way these subsidies have been distributed. India's subsidy programme has been run largely on paper and documented in handwritten ledgers, and has combined with deep rooted corruption. Consequently, it did not reach the intended recipients. The government in the past also decided what poor people needed — cheap rice or fertilisers — and that is what poor people got — usually governments are not good at figuring individual priorities.

Three major changes have set the stage for greater fairness in India's market model. First, Aadhaar, the world's largest biometric ID project to uniquely identify each and every Indian using biometric data of finger prints and iris scans, has now registered 1.2 billion Indians — an unprecedented success in world history for any public programme.

Aadhaar allows individuals to verify their identities at almost zero cost — very important to any mass scale distribution programme.

The second change was India's financial inclusion programme, Jan Dhan, which opened bank accounts for the unserved. Since 2014, 300 mil-

lion bank accounts have been opened, bringing a completely new class of previously unbanked people into the banking system. These people are largely the intended beneficiaries of government transfers. Now armed with bank accounts, they were in a position to receive benefits directly from the government, bypassing agents and avoiding leakage. Aadhaar enables such transfers, since it can uniquely identify beneficiaries.

The third change is in India's taxation system on goods and services. The Goods and Services Tax, or GST, is set to change compliance due to its online nature and the way input taxation works. The GST should help boost revenue by reducing evasion of taxes on both goods and services and income. The government will then become a more



RIDHAM DESAI

decades, China has pursued "civil-military fusion", consciously applying technologies from the civilian sector, including those acquired from abroad for commercial purposes, to military applications. It has also utilised its cyber capabilities to gain access, through hacking, to cutting edge military technologies developed through years of research by US firms. US citizens of Chinese origin and Chinese scholars working in sensitive facilities have often been mobilised to clandestinely transfer confidential plans and blueprints to Chinese entities. However, this should not detract from the advances China is making in generating advanced technologies in its own research and technical institutions based on the vast knowledge pool that it has acquired over the years from multiple engagements with the US, Japan and Europe. As its technological capabilities have progressed, its military strategy has also undergone changes. In the first phase, China drew lessons from Operation Desert Storm in 1991, in which the US forces used Precision Guided Missiles (PGM) and integrated information networks to overwhelm the formidable conventional forces deployed by Iraq. This led to the concept of "informationised warfare" which impressed Chinese military planners who then determined to master it over time. The restructuring of the PLA to achieve "jointedness" among the land, sea and air forces and the integration of space, cyber and electronic warfare capabilities have enabled seamless system platforms. In 1996, the Chinese felt humiliated by their powerlessness against the two US carrier groups that steamed into the Taiwan Straits after China began lobbing missiles around Taiwan as a show of force. China began developing asymmetric capabilities to make any similar US move in the future both risky and costly. The DF-21 D anti-carrier ballistic missile with a 1,000 mile range was the result. That the US acquiesced in China's artificial island building in the South China Sea and its subsequent militarisation of these islands, may have convinced China that it now has those asymmetric capabilities in place. More recently, Chinese military strategists have been talking about moving towards "intelligentised warfare" using AI in weapons development and military tactics. If the earlier contestation was between informationised systems, the future they claim would be marked by "algorithmic competition" in which China believes it is racing ahead of the US.

The US is currently debating a credible and effective counter-strategy but there are even more ominous implications for India's security. These need to be assessed carefully and comprehensively and an appropriate strategy crafted to deal with the challenge posed by these developments. Like China in an earlier phase, we need to develop and deploy asymmetric capabilities in the short term to deter an assertive China even while focussing on mastering, over time, emerging technological capabilities which are now the basis for geopolitical influence.

*The writer is a former Foreign Secretary and a Senior Fellow, CPR.*

efficient collector of taxes.

While GST will cause tax revenues to rise, Aadhaar and Jan Dhan have already been successful in transferring money to poor people. Over the past three years, the government has significantly scaled direct benefits transfers or DBT. There are now 439 government schemes conducting transfers via DBT. Cumulatively since F2014, DBT transfers have amounted to ₹32 billion, saving the country about ₹142 billion in leakages. The breadth of delivery is unprecedented in world history. A lot of the DBT is in cash. This opens up opportunity for the recipient to decide how to spend the cash rather than the government deciding. Thus, recipients may choose to educate their children or upgrade their homes instead of buying more rice. DBT ensures intended people receive the money and dis-intermediates middle men, reducing leakage and saving billions of dollars of tax payers' money.

Of course Aadhaar is not flawless. Several people — especially those most needing DBT — have suffered authentication problems. In October 2018, the Supreme Court verdict on Aadhaar delivered the punchline: The Court observed that while it is possible that there is some unfortunate exclusion of close to 0.2 per cent, it is better to work towards reducing the 0.2 per cent to 0 than to jeopardise the 99.8 per cent, many of whom are among the most marginalised and biggest beneficiaries of Aadhaar.

For the first time in India's history, there is an opportunity for the government to induce fairness in a market system by collecting taxes more efficiently without evasion and distributing them to poor people in a targeted fashion without leakages. This sets the stage for a virtuous cycle, which is that such fairness allows India to become more market oriented, which in turn makes India more efficient. This virtuous cycle of efficiency and fairness means higher growth, further reducing poverty. We dare say India is on its way to once again becoming a dominant global economy. Indeed, we are forecasting that in 10 years, India will become the world's third-largest economy. Fingers crossed.

*The writer is managing director, Head of India Equity Research and India Equity Strategist, Morgan Stanley*

## Why intellectual humility pays



### BOOK REVIEW

SANJAY KUMAR SINGH

People of a certain vintage would have observed no doubt one major difference between the time they came of age and now — the obsession with looking good that leads many young men and women to make a beeline for gyms and beauty parlours. There's nothing wrong with this, except that if some of their time and resources were to be also devoted to burnishing the mind, the benefits over a lifetime would perhaps be far greater.

We humans have a well-documented tendency to overestimate our prowess at different activities. We regard ourselves to be better at driving, cooking, swimming and a host of other skills than we actually are. This overestimation is especially stark in the case of thinking, where the consequences of lack of skill can be disastrous, though this is not apparent immediately.

The good news is that a lot of research now exists that can help one become a better thinker. Edward de Bono's books are a good place to begin with. According to him, most errors in thinking are the result of errors of perception. He offers extremely simple tools like CORT thinking technique and six thinking hats that allow one to examine an issue from several angles. His TO-LO-PO-SO-GO framework can be useful to anyone trying to make a decision in a structured manner.

In the book under review, author David Robson asserts that intelligence cannot be equated with good thinking skills. A highly intelligent person is like a car equipped with a powerful engine. But whether that car will reach its destination or veer off a cliff depends on the driver's skills. Therefore intelligence, he emphasises, needs to be deployed with care.

Furthermore, intelligence alone may not be adequate for being successful. IQ (intelligence quotient) testing gained a lot of popularity in the twentieth century as a tool for selecting future leaders. A researcher named Lewis Terman administered this test to a large number of American children and then followed their lives across decades to see how they — especially the ones with stratospheric scores of 190 and above — fared. Although those with high IQ scores did on an average do better than those with poor scores, many

of the top rankers did not fare as well as expected.

To explain this, one can draw an analogy with basketball, where a player needs to have a basic minimum height to be competitive. But thereafter other factors become important for determining success. According to the author, while IQ tests may be able to evaluate the kind of intelligence that enables students to do well at academics, success in life depends on a person possessing a host of other forms of intelligence, such as creative, practical and execution intelligence.

The book's second chapter makes the point that people possessing the highest level of intelligence often espouse completely irrational views. Mr Robson refers to this as "dysrationalia". Arthur Canon Doyle, creator of Sherlock Holmes, the character that epitomises intelligence and logical reasoning, believed in seances and after-life. Thomas Edison, who had more than a thousand patents to his name, fought an utterly pigheaded and long-drawn battle with a rival in favour of the direct current, long after it

had become apparent that alternating current was the superior technology. Einstein wasted the last 25 years of his life developing a unified theory of the universe that failed to stand up to scrutiny, when he could have devoted his fertile mind to more productive pursuits. More recently, Steve Jobs may perhaps have lived had he stuck to doctors' counsel, instead of trying to cure his cancer through herbal remedies, spiritual healing and fruit juice-based diet.

One reason for an inordinate level of irrationality among the intelligent is that people adopt beliefs and positions that are emotionally comforting to them. Then, instead of examining their validity dispassionately, they use their high intelligence to garner evidence in support of their viewpoint, ignoring all evidence to the contrary.

How can one overcome this pitfall? One way is to cultivate intellectual humility. Avoid being rigid and dogmatic. Be open to other peoples' views, and if required, change your position in the light of new evidence.

Benjamin Franklin's method called the "moral algebra" can also help. When Franklin had a crucial decision to make, he would write down the points in favour and against on a piece of paper. He would then assign weights to each of these points, and finally make a decision based on which side carried more cumulative weight. This exercise was conducted deliberately over a couple of days.

Many of the other chapters in this book, such as the ones on how to deal with fake news, get better at learning new skills, and prevent hierarchy and ego from thwarting good decision-making in a corporate setup are insightful. Anyone keen to become a more evolved thinker will profit from reading this deeply-researched book.

**THE INTELLIGENCE TRAP: Why Smart People Do Stupid Things And How To Make Wiser Decisions**

David Robson

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