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Introduction

The India-US Forum is a platform for Indian and American leaders to shape the future of India-US strategic partnership through dialogue and collaboration. It is annually convened by the Ananta Centre and Ministry of External Affairs, Government of India. The Forum is held under the Chatham House Rule and participation is by invitation only. The attendees are high level representatives from government, Congress/Parliament, industry, media, academia and think tanks.



Over its 7 editions, the Forum has emerged as a coveted space to exchange ideas and set the bilateral agenda for cooperation. The 7th edition, held from 27-29 January 2024 in New Delhi, was co-chaired by Vinay Mohan Kwatra, Foreign Secretary, Government of India, and Jamshyd Godrej, Chairman, Ananta Centre and Chairman, Godrej & Boyce Manufacturing Company Limited.

In a productive and historic year for the India-US Partnership, there has been an unprecedented level of cooperation, demonstrating a new era of strategic alignment. The regular visits of heads of major US agencies and departments to India highlight this multiplicative relationship. With the agenda expanding from 2-3 to 163 concrete deliverables, the depth of collaboration is evident. This approach was adopted during the Forum as well. The agenda covered a diverse range of topics including the Quad, West Asia, future of warfare, supply chains and investment, green transition, R&D and tech, maritime security, health and planetary defense.

The discussions highlighted a noteworthy shift in the India-US bilateral relationship through the increased trust between India and the US as partners. This trust manifests itself in the increased scope of the partnership, the increased intensity of exchanges at a ministerial level, the growing scale of engagement, as well as in the nature of conversations, which have become frank and cooperative. Subjects such as trade, technology, Iran, Iraq and China, which were issues of friction, have now become areas of cooperation.

As intent and alignment converge, the focus now shifts to collective ability. New opportunities for the India-US Partnership are presented by changes in the international political arena, the evolving technological landscape, increased trade fragmentation, newer forms of multilateralism, and increased conflicts. Many challenges that the world faces today will actually make the relationship between the two countries stronger.





S. Jaishankar

The Future of War: Tomorrow's Battlefields

National security is driving geopolitics like never before. Geostrategic heft has always come from a country's economic strength and wealth, but of late it has hinged on the ability to convert economic surpluses and technological advantages into currencies of hard power.



Arsenals of Democracies vs Non-Democracies

In this regard, the arsenals of non-democracies like China, Iran, and Russia is faring far better than the arsenal of democracies. Ukraine is a good example of this. At one time, Ukraine was firing one lakh artillery rounds in a week. The combined unit of western allies, including the US, could only supply that volume in a month. On the other hand, North Korea has supplied artillery ammunition to Russia more efficiently than the collective West. The threat from China is pertinent as it is arming itself faster.

Democracies with open economies like India and the US are not faring as well as China where industry is dominated by the state. The need for consensus in decision-making from ideation to execution to outcomes slows down the process unlike in autocratic dispensations. Agility in the stages from ideation to creation to finalization of the contract is going to be the most important competitive advantage along with swift decisions on how to utilize modern technologies.

While it is understandable that the execution process in democracies is slower than in autocracies, there is no reasonable explanation why non-democracies are quicker with ideation. Democracies today are allowing technologies to mature before putting them through a procurement pipeline and eventually subjecting them to the tyranny of L1. At the end, a new technology either becomes obsolete or loses out in the battle of contracts to a less impressive but low-cost option.

The American defense budget is three times that of China's, and China's defense budget is three times that of India's. Beijing causes displacement anxiety in Washington, but Delhi does not cause similar displacement anxiety in Beijing because Delhi is not building naval capacity, acquiring missile defenses, and delaying theater commands. Delhi needs to inject speed and scale in force structures. There are delays in Beijing too with the corruption in their rocket force, but that cannot be a point of solace for India.

Australia recently launched a project (AIR6500) to develop the joint battle management capability. The Australian Defence Force identified clear requirements that contractors had to meet for development, procurement, innovation, and production which enabled the contractors to get internal alignments within their companies. This approach allowed for agility in planning with the private sector making timely moves to capably deliver and collaborate with partners on integrating nodes in a network of indigenous as well as new systems.

Co-Production and Co-Development

If scaling on munitions and outpacing the stockpiles of the adversary is the only way to win, partnerships geared towards co-production and co-development with knowledge transfers will have to be prioritized. This will not be possible till export-control frameworks are amended. Frameworks currently in place reflect the Cold War mentality of knowledge protection and the only available avenue for transfer is via licensing. In the current context, licensing agreements cause problems when partners need to work on systems/ products that have not been developed in the US and for which there are no licensing agreements in place.

Co-development implies taking a problem seamlessly from a concept of operations to a product but there are no rules in place to enable that. India, in particular, needs technology support from the US but irritants along the way like International Traffic in Arms Regulation (ITAR) need to be resolved. In return for the technology, India could provide the US with AI business-case models.

Building up the traditional military arsenal on a war footing is an expensive endeavor for even the most developed economies but while deterrence is costly, wars are costlier.

The invasion of Ukraine, the Israel-Hamas conflict, and the potential for conflicts in other parts of the world imply that deterrence has failed and if that is indeed so, capability asymmetry between offense and defense needs to be addressed urgently. If the cost of defending against a \$1,000 drone with a 5-kg munition on it is going to be a million-dollar

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missile, then the defending side will lose. Till this cost to capability equation is addressed, the adversary with the \$1000 drone will always want to escalate.

There is an imminent need to assess how commercially manufactured technologies can be used to supplement military manufacturing. In the 1940s, one of the biggest advantages that the US brought to World War II was its ability to turn around manufacturing from other metal/ heavy industries towards tanks, ammunition, and weaponry. Today, supporting just one theater of conflict has become overwhelming for the military-industrial complex. It is advantageous to use existing plants and machinery that are making Advanced Driver Assistance Systems (ADAS), for example, towards building precision-guided ammunition.

Adaptable Lessons from Ukraine.

While conventional munition readiness is a lesson from Ukraine that can be applied to militaries globally, India and the US need to be careful about what else they can glean from Ukraine's urban warfare environment. The expected theaters of future conflict for India and the US will be in either Ladakh or Taiwan. Neither are urban and both will need longer-range capabilities that can inflict damage deep into an adversary's territory. Conversations about 20/30/50 minutes of endurance that are relevant for Ukraine are redundant in any part of the Indo-Pacific.

Another adaptable lesson from Ukraine is related to network capabilities. One of the first things that the Russians did when they went into Ukraine was take out all ground communications. The US has a new capability in low-earth orbit (LEO), that is, low-latency communication satellites which have kept Ukrainians on the battlefield so far.

Deterrence has really failed in cognitive warfare where there is also an asymmetry of capability. The character of warfare has changed. It is no longer just kinetic or on the battlefield. It is now on media platforms and in AI applications. There is a need for a deeper analysis on how the efficiency of recent large-language models affect the warzone. Increased investment in human-machine teaming is also needed. AI will create the new strategic haves and have nots by changing force design, architecture, and the way in which wars are fought.

Innovation and Interoperability

At the moment, autonomous capabilities are being looked at in silos with a long-term lens. Companies are thinking one product at a time, like building software that can help link sensors to shooters. Before considering innovations for the automation of sensor-shooter-kill chains, there is a need to assess how existing tools can be utilized with automation.

This begins with addressing the fundamental problem of how information can become interoperable. For instance, if India is getting intelligence from a Boeing or a Lockheed platform while trying to take out an adversary using a weapon made in India, do they possess the technology and resources to do so? In the digital era, the military that can push out software faster is more likely to defeat other forces on the battlefield.

Disruptions in weapons innovation will come with established private sector players collaborating with startups. Another space ripe for identifying disruptions are the joint exercises undertaken in the Indo-Pacific where wargaming experimentations allow a chance to demonstrate new capabilities and show how to integrate a variety of capabilities that compel forces to get ahead on procurement.

There are clear strategic goals that should guide the future of warfare. First, find a way to invalidate the capabilities of rivals. Second, invest in capabilities that can raise the costs of adversaries for causing conflict. Third, increase the scope and scale of the capabilities that a country can bring to the battlefield.

As government and industry think about potential problems that could arise in future battlefields, they also need to revisit strategic assessments of

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the past regarding the future of conflict. The recent conflict in Ukraine can be a useful case study.

Until a few decades ago, the Indian military planned its strategy assuming that conflicts in the future will be shorter. That strategic understanding has been reversed. The traditional military establishment believed that drones would not be able to inflict

damage to artillery or armor. With the transformation of the drone-missile complex, even crude drones could inflict damage on the Russian Black Sea fleet in Sevastopol.

India's Force Modernization

There is a force modernization revolution underway, underscored by asymmetry and precision. Imaginative use of sensor architecture and the marriage of microelectronics with explosives has made dumb munitions precise. The air defense environment is evolving with surface to air missiles (SAMs) undermining fighter aircraft. Militaries need to adjust to these revolutions and hybridize their fleets.

India is in the midst of its most comprehensive national security makeover since Independence. The prime minister delivered a speech to the combined commanders meeting in 2015, the substance of which is gradually unfolding. The Defense Research and Development Organization (DRDO) reforms are progressing, but given the China challenge a lot more needs to be done. The Indian military needs to change its character and profile from one designed to secure a \$3 trillion economy to one potentially securing a \$35 trillion economy.

India is in a neighborhood of economically and politically fragile countries. Some of these countries are friendly with China but there is a risk that all of them could develop a reliance on China.

Pivot from Continental to Maritime Power

India's challenge currently is to find a balance between being a continental power and a maritime power. Looking at India's geography, the major security threats are on the land frontier, most significantly along the LAC. Continental routes to the north are not accessible with China occupying Tibet, the west is closed because of Pakistan, and the east is troublesome due to the situation in Myanmar. India's destiny, thus, lies in the seas. The Indian stake in a free and open Indo-Pacific is immense.

India's military structure needs to prioritize naval frontiers to address the threat from China. The current focus on land frontiers is fundamentally shortsighted. After the operational rebalancing, India has done what it could at the LAC. That frontier still cannot be taken lightly but the time has come to make a fundamental turn to the seas in terms of resourcing. Four hundred Chinese ships already have reasonable staying power in the Indian Ocean

Region (IOR) and it will grow phenomenally in the coming years. When that growth occurs, India will face a strategic squeeze from both the LAC and the seas.

Hybridization Challenges

India will have to consider three elements while confronting the challenge of expansion and hybridization. Currently, innovation spending is targeted towards platforms but there is a need to also focus on weapons. Second, there is a lack of emphasis on communications innovation; the Ukraine war has shown how easily a traditional military can be taken off the grid by an adversary. And third, while India is producing data in large quantities, it needs to develop the ability to utilize that data.

The US still does not have a response to Russia's tampering of the 2016 Presidential elections. Clearly, there is a lack of digital literacy that needs to be addressed. The information environment has undergone a dramatic transformation, and disinformation as a tool of warfare will be an even more pressing concern in the age of AI. There are some solutions on the table for watermarking data and protecting credible information but these need to be scaled up significantly.

Like-minded countries must identify solutions to regulate cross-border data flows to ensure that hostile foreign powers do not have access to the quantum of citizens' personal data. Companies of adversary countries operating elsewhere and being able to mine data is one part of the concern.



Anil Chauhan (Gen.)



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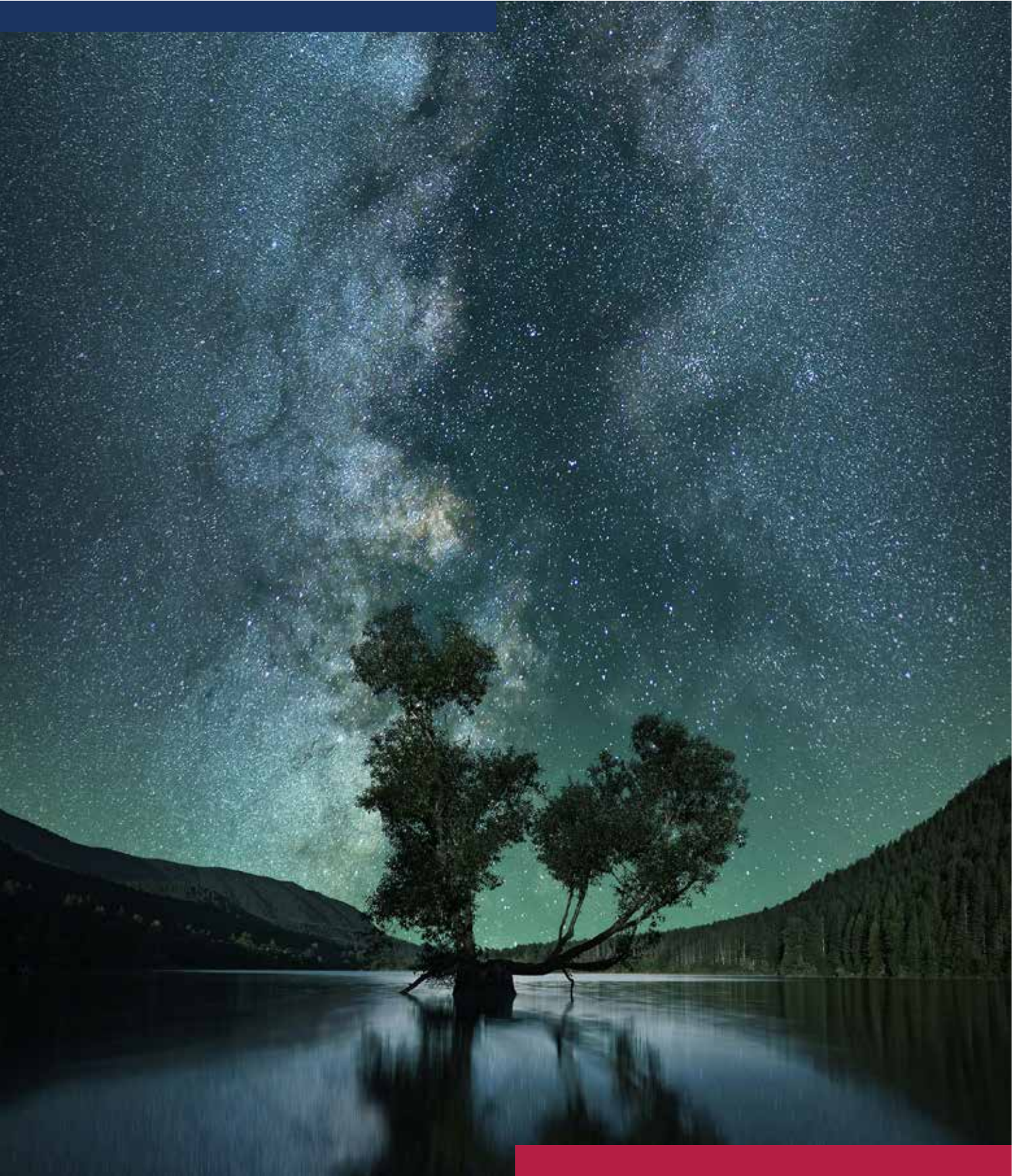
James H. Baker and Arun K. Singh



R Mukundan, V L Kantha Rao, Geoffrey Pyatt, Sunit Kapur, and Arunabha Ghosh (L to R)

Star Trek: Planetary Defence and Strategic Space

Space is no longer the domain of just governments since a multitude of state and non-state actors now have access to space. Space-based services support the world's financial information, communication systems, scientific discoveries, and environmental monitoring. It is increasingly contested and congested and that brings its share of both risks and opportunities.



The Rise of Private Space Industry

The last decade has seen the rise of the private space industry all over the world. The ecosystem expanded further by the creation of the space force and the launch of the Artemis lunar exploration program formally established in 2017. India, in particular, has taken numerous steps forward in the last two years—creation of an independent regulator, announcement of the India space policy, signing of the Artemis Accords, the first soft landing on the moon, announcement of intentions to put a space station into orbit by 2035 and an Indian on the Moon by 2040, and finally the creation of the tri-service integrated Defense Space Agency.

Space has always been a matter of national security. Activities in the domain have been targeted towards protecting and preserving life on Earth via communication, intelligence, surveillance and reconnaissance (ISR), early warning systems, and about denying your adversary the same capability. Not much has changed on that score but the rise of the commercial industry has democratized space.

ISRO began breaking down barriers for the private sector two decades ago by hosting launches of satellites built by commercial players. An ecosystem of entities like Planet Labs and Spire who are delivering thousands of datasets every day has changed the landscape of geospatial intelligence. In 2017, when India organized a launch with 70 satellites into orbit, 18 of them were commercial satellites.

Deterrence and Rules of Development

Space is critical to the US, its way of life, and its way of war. The US Department of Defense (DOD) believes that America's competitors understand how critical space is to the US and intend to disrupt, deny, and degrade their space capabilities in the event of conflict. These competitors are now developing, testing, and fielding capabilities to target the American and allied satellites. China, in particular, is building its space architecture to that end.

A race to build space capabilities has increased the need for adversaries to build denial capabilities leading to a renaissance in Direct-Ascent-Anti-Satellite weapons (DA-ASAT) testing.

It may seem like a straightforward step in the production-deterrence loop but defense in space carries a different set of considerations than on Earth. Small shrapnels of debris in space can damage entire satellites and take a long time to

A race to build space capabilities has increased the need for adversaries to build denial capabilities leading to a renaissance in Direct-Ascent-Anti-Satellite weapons (DA-ASAT) testing.

degrade, posing a threat to the entire Low Earth Orbit (LEO). The Chinese test, for example, left a couple of thousand pieces of debris that are still in space and they will degrade very slowly over time making testing disruptive and dangerous for all actors in the domain.

In 2022, the US declared a voluntary moratorium on destructive testing to prevent debris. Since then, the US has made efforts to bring like-minded countries as well as Russia and China on board this norm, without significant success. Perhaps the reluctance in adopting this norm comes from the lack of clarity on whether it proscribes the use of DA-ASATs in a conflict.

De-Congesting the Low Earth Orbit

LEO is getting increasingly congested and our methodologies to keep track of this are not absolute. Now space-based sensor networks are able to do surveillance of space from space but by and large it has been surveillance, from land through a radar or a telescope, and the sensor data is sparse. The more assets that get deployed in LEO, the more complicated will be the problem of understanding the behavior of adversary satellites.

Right now, it is all heuristic. It is also made more complicated by the fact that all countries try to mask the existence and capability of their spy satellites. Sensor technology is rapidly growing. In maritime domains, for instance, which are more mature, when a ship comes within a certain radius of another ship it is possible to assess from the approach pattern and other factors whether it is considered hostile. In space, this technology is a constantly evolving capability.

LEO is critical to our way of life, civilian and military. It is incumbent upon all actors in space to model responsible behavior and put pressure on adversaries to do the same.

Disruption and Denial

US adversaries have an interest in disrupting American space capabilities because the US is asymmetrically dependent upon in a joint war fight. China and Russia, as of now, are not very dependent on space but China will eventually get there. An obvious pathway is to deny, disrupt, and/or degrade US space capabilities which could be done by targeting either the terrestrial base or orbit base. There are also reversible and irreversible ways to disrupt and deny. Electronic Warfare (EW) jamming is a reversible non-kinetic way to disrupt and deny as witnessed in the Ukraine conflict. The way forward is to build resilience and redundancy to ensure localized jamming doesn't have a disruptive effect on the entire architecture. For the US, this means leveraging redundancy and resilience with allies and partners.

In India's case for example, China is pursuing both reversible and irreversible capabilities on the terrestrial and orbital base that can have a significant impact on Indian space architecture. This would have potential military and strategic effects. The US and India have a shared interest in having redundancy resilience and building up capacity to deny China that ability to disrupt American allied operations in space.

India and the US have been doing military exercises in other domains. They should also imagine space exercises which will eventually move the threshold up to RPO, proximity operations, and directed energy weapons.

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Innovate - Procure - Rinse - Repeat

The Indian industry lacks imagination. Across DTTI, iCET, and other fora, it's a failure on the part of Indian industry to come up with ambitious projects. India should be worried because they don't have enough

assets in space. Previously, in times of need, India had to ask allies for packaging and targeted information but that is not a reliable pathway.

India still lags behind on defense procurement, specifically high technology procurement of products at prototype stages with more R&D to go.

Space proves to be a bigger problem for procurement. In the commercial space industry, India moved to small satellites to bring down the cost, enable rapid development, and decrease the cycle of upgrades from 10-15 years to 2-3 years. This has landed the industry in a fast paced environment where the technology is aging rapidly. The procurement timelines from a defense perspective does not match this rapidity. It begins from conceptualization, to an assessment of operational requirements, and then into procurement taking an average of two years by which point the technology has already evolved.

This cyclical Catch-22 can also cause deliverable backlogs from existing space assets. For instance if a country launches a satellite for 15 GB per second connectivity and another country launches one for 70 GB per second the same day, the former country is on the backfoot within a day of having a successful launch. There is an urgent need in India to upgrade procurement methodology from the ground up including bringing down the Request for Proposal (RFP) to a single page.

This problem, however, is not unique to India. Defense procurement is slow and tough across the world in varying degrees.

India faces significant challenges in this regard. From the point at which a manufacturing contract is awarded it would take at least 18 to 24 months to deliver a satellite predominantly because there is no domestic semiconductor manufacturing.

Industrial Innovation Challenges in India

The Indian space industry is indeed growing but industrial innovation is still lacking. India, historically, has been very good at system integration but not so much at developing component-level core technology. While there exist enough contracts to bid for with the Government of India to keep the industry functional, the funding for innovative and ambitious projects is scant. It is not just the government though; the vision in the private sector is also lacking.

In the Innovations for Defence Excellence (iDEX) Challenge for instance, the government provides 50 per cent of the cost of the project in funds and

the remaining is on reimbursables. Reimbursables is an unsustainable format since it does not cover operational costs like office maintenance and HR, it only applies to tech expenses. In the meantime, to cover those costs, someone has to put in the working capital which creates a functional gap. All this without a streamlined policy for MSMEs is not feasible.

The minimum revenue threshold is another thing that could be reconsidered. It dictates that bidding companies should have already done business at certain levels/ with certain actors which disqualifies innovative start-ups.

In an industry where development takes 2-3 years, demonstrating the bigger picture to MSME bidders in platforms like iDEX Challenge is crucial. It tells the story of where the challenges are taking the industry, allowing companies to plan better and to be better prepared for the commercialization timeline-obsolete technology cycle race.

India - US Collaboration Avenues

There is an opportunity for India and the US to integrate commercial innovation into the national security space architectures but it must be done in a way that ensures integrated commercial solutions are available during times of peace and war.

Military space cooperation would require actors on both sides to jump through many hoops of bureaucracy and export controls. But in the commercial space sector there are opportunities for direct links between Indian and American commercial entities. Cooperating in launches would also be a huge step forward. Any launch vehicle is a complex integration of multiple subsystems, and cooperation on this front has to currently go through the hiccup of International Traffic in Arms Regulation (ITAR) even for elements purely on the commercial side. There is a need for classification reform in the prime and non-prime sectors to enable this cooperation.

In terms of speed of India-US collaborations or export/import regulation, space should not be seen in isolation to the overall relationship. The bilateral relationship and exchanges in the defense sector are nascent across all domains. Trust builds with each successful project. As the frequency of exchanges increases, the familiarity will too.

Call for a Space Policy Ecosystem and Global Standards

At the policy front, governments need to employ full-time workers in positions tasked with creating

standards for space. By and large these standards are set by either engineers pulled away from a project or bureaucrats tangentially related to the space domain but who carry a separate full-time portfolio. Think tanks dedicated to this cause would also be useful, perhaps funded by the Quad.

The relationship between in-space cooperation and intelligence cooperation is a close one. Cyber and information security is key to enabling a functional space-cooperation relationship so that classified information and technology practices can be exchanged in a timely manner.

The lack of imagination from the industry is a bigger hiccup than export controls because both governments are actively facilitating collaborations now. The companies are unable to identify exactly what obstacles they want the Government to address and their rationale is that even this identification takes certain billable hours with legal teams that do not make sense to the cost of that project. Outside of that, the number of days required for processing has substantially reduced; so red tapism is no longer valid.



Eric Garcetti



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Maritime Security: From the Seabed to the Surface

The US Indo-Pacific Command (USINDOPACOM) assesses that China already has operational control over the South China Sea (SCS), but a victory over the US in the Western Pacific would give it overall control even in a conflict over the SCS. This would have significant ramifications for India because there would be nothing preventing the Chinese from projecting military power through the SCS into the Indian Ocean region (IOR).



SCS is a theater that is always active. The Chinese are aggressive with gray-zone activities vis-a-vis the Philippines and Taiwan to exert coercive influence and drive wedges in relationships. There is a narrative that doubts the possibility of an imminent multi-actor armed conflict in the SCS because of the economic interdependence between China and the US.

However, economic interdependence does not prevent war, nor does it automatically cease in a war. It continues through intermediaries. In the event of a war between the US and China, trade would still continue. Indeed, direct and indirect trade continues between Ukraine and Russia. Semiconductor purchases by Russia from Armenia, and by both Ukraine and Russia from Kazakhstan have skyrocketed over the last couple of years.

Xi's Strategic Posture and Conditioning for Conflict

President Xi appears to be politically conditioning the Chinese population for the possibility of war, and has acknowledged the role his dual circulation economic strategy has to play in China's security calculus. The PLA is developing its capacities—nuclear-powered aircraft carriers, attack submarines, space architecture, a naval base in Cambodia with a pier long enough to accommodate an aircraft carrier, etc.

There have been murmurs about a Chinese plan to invade Taiwan by 2027. President Xi has denied this to President Biden, but this means very little because of the high incentives for dissimulation in the Chinese system. When Biden brought up Taiwan as the most dangerous issue in Sino-American relations and stressed the need for a peaceful resolution, Xi responded that "peace is well and good but this needs to be resolved". Beijing dislikes President Lai Ching-te and his Democratic Progressive Party, and the outcome of Taiwan's election has made the possibility of reconciliation between the island and PRC more remote.

If the US is defeated in a regional conflict on Taiwan, it is plausible that many ASEAN countries will bandwagon with China. The shift towards the US of countries like the Philippines is predicated on betting on the winning horse, and this calculation will be upended if the US becomes the weaker choice. In such a scenario, ASEAN countries will create highways of access in the IOR for Beijing, leaving India without a layered defense against the PLA.

Western Pacific to IOR

Securing the IOR is important for India, but the US does not perceive a similar urgency to increase its military strength in the region. Similarly, the priority for the US is securing the Western Pacific, which does not raise the same security concerns for India. The PRC has inserted its footprint in both regions.

It could be argued that in the event of a maritime conflict in which the Americans effectively defend the first island chain and India holds ground in the IOR, would be to the mutual benefit of both the US and India. The Americans seem to have this eventuality in mind as they outsource the security of the IOR to India, and hope that this will contribute to deterrence in the Western Pacific.

This outlook that any maritime conflict with China would involve the Western Pacific and IOR simultaneously, while probable, has resulted in a view in Washington and Europe that the entire Indo-Pacific is but one theater. This position is completely incorrect. The security imperatives in Oceania, Central Pacific, the South China Sea, and the Indian Ocean are varied. There is need for like-minded countries across these theaters to coordinate and combine their forces.

COFA and the Impact of Delayed Renewal

Three Pacific Islands countries—the Republic of Palau, the Republic of the Marshall Islands (RMI), and the Federated States of Micronesia (FSM)—underpin the entire defense architecture of the US in the Pacific. These countries have signed Compacts of Free Association (COFA) with the US, which enable the defense of the first and second island chains, resupply for Japan and South Korea, and allow freedom of operation from Hawaii to Guam. People of these countries can work in the US, join the US military, play in the US baseball team, and have US zip codes. Two out of the three countries recognize Taiwan.

The defense components in these agreements are extensive, second only to the defence arrangements in the US homeland, but they are voluntary, so the signatories can withdraw at any time. Financial and services components are codified in COFA, and unlike the voluntary defence elements, COFA is periodically renewed. COFA expired in September 2023 and was stuck in the US Congress for nearly six months before it was passed in March 2024.

Coordinated efforts and timely delivery of assistance, customized to the requirements of the country in question, is the only way to build lasting credibility.

China knows these three countries are the key to cutting off the US's access across the board in the Pacific. While COFA was stuck in Congress, the Chinese started pumping money into Palau's tourism sector, until they accounted for half of the sector's business—at which point they conditioned infusion of further aid/ business on Palau derecognizing Taiwan. The current President of Palau is up for re-election in November 2024 and if he loses it is likely the replacement will succumb to Chinese pressure and flip on Taiwan.

On the ground, the tide seems to be turning. The Senate in Palau has passed a resolution against the deployment of US Patriot missiles to protect the site of an over-the-horizon radar installation—a direct outcome of the Chinese indicating to Palau that a radar installation is redundant since all it means is that they would have to bomb Palau half a minute before they strike Taiwan.

There are similar stories in FSM and RMI.

In RMI, two Chinese agents attempted to set up a country within a country, and came within one vote of bringing down the government. The agents were eventually charged in the US, where they pleaded guilty, but one of them was deported back to RMI just before the elections of 2023, where she continued operations.

The former President of FSM, David Panuelo, wrote three letters between March 2022 and March 2023 to senior leaders of his country and to the leaders of the Solomon Islands and Pacific Island countries, detailing threats emanating from Beijing, including money flows from China to bribe political leaders as part of a strategy to build contingencies for Taiwan.

If current patterns continue, the US is at risk of losing the Pacific either due to a lack of understanding of the paramount strategic importance of these locations, or through sheer ineptitude. If these three countries cease to be a safe zone for the US, the entire defense architecture of INDOPACOM will be compromised.

The key is to not look at these islands merely as pieces in a larger maritime security architecture. There needs to be a more comprehensive approach to development and building domestic capacity in the region. The effort to block Chinese access points has to come from building an economic strategic backbone in these countries.

Building Credibility in SIDS

The Chinese have geopolitical intentions but they speak the language of development. India and other Asian powers tend to speak the language of contestation which does not resonate with these smaller countries.

India does not generally prioritize security in the South and Central Pacific, but it is the only country that can position itself as an alternative to China in development and economic schemes. For instance, an Indian film production crew shooting in Palau itself would create an economic boost that would disincentivize Palau's reliance on China for their tourism sector.

Collective maritime competence needs to be built in both the IOR and the Pacific. India, Australia, Japan, and France are all making substantive efforts in the IOR, but they need to coordinate especially in assistance and training efforts for Small Island Developing States (SIDS), the group of 39 states and 18 associate members of UN regional commissions scattered across the world's oceans, including the Caribbean and the Atlantic.

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Seabed: The Next Frontier

The bigger players cannot just dump platforms and capabilities on the SIDS without making an assessment of their short-term and long-term concerns. More often than not, the primary concern

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of a SID is outside the realm of security. Rising sea levels due to climate change threaten the very existence of these islands, and top the list of their concerns.

Maritime frontiers have not just spread horizontally across the oceans or within the IOR, they have spread vertically too, making the seabed the next frontier.

The Nord Stream pipeline supplying Russian gas to Germany, which was destroyed in a series of explosions in September 2022, was a piece of critical infrastructure that was easily accessible at a depth of only 80 to 110 meters. The Baltic connector incident of October 2023, in which a Finland-Estonia gas pipeline was damaged, occurred at a depth of just 60 to 70 meters. It would take only eight attack points to take Bangladesh, Myanmar, Thailand, and Cambodia off the Internet. The communications infrastructure is highly concentrated and very easy to attack, because the locations are known.

If the PRC invades Taiwan, one of its first actions would be to cut off the Internet. Only 14 cables connect Taiwan to the rest of the world. There are secondary systems that Taiwan could activate but it would be a substantial downgrade. Key energy infrastructure across the SCS and the Gulf of Thailand, and connecting the Japanese archipelago sit at depths that can be accessed easily with commercial systems.

The responsibility for securing undersea infrastructure currently lies with the companies that install them. Governments have not taken up the mantle yet; at the same time, companies are not prepared to secure all their assets. The space is nascent, expensive, complicated, yet expanding. Companies are beginning to talk about the fusion of unmanned systems and AI for developing effective protection capabilities. Any surveillance mission will occur in a disparate sensing field, and data from several fields of information will have to be pieced together. Data from the deep seabed will appear unlike any other raw input received by geospatial surveillance assets. AI and ML will have to synthesize this data to generate real intelligence.

Historically, undersea infrastructure has not been an area of warfare because it was viewed as a common good. In the last 15 or so years, it has become an attack vector. There are competing interests from the PRC and the US when either side tries to install new cables. The two sides are also competing to own the installation of a major cable that connects three continents. The protection of undersea assets has not so far been baked into the

companies' costs of operations and maintenance, and governments need to step in soon.

The scale of the challenge is daunting. Thousands of miles of assets need protection at all times. India, US, and other partners need to start thinking of the subsea in the same way as they think of space.

The responsibility for securing undersea infrastructure currently lies with the companies that install them. Governments have not taken up the mantle yet; at the same time, companies are not prepared to secure all their assets.



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Whither Goeth China: Internal Dynamics And Global Implications

China's international behavior is often subject to scrutiny. Its internal workings continue to be shrouded in mystery. This essay will discuss China's internal dynamics, trade policies, risk-management strategies, its stance on Taiwan, and the activities of the People's Liberation Army (PLA).



Internal Dynamics

Despite significant investments in internal security and surveillance, there are indications of potential weaknesses in China's centralized power structure. The Chinese miscalculation of the COVID-19 policy in 2022 and the failure to gauge public sentiment is a pertinent example. Similarly, the dismissal of the entire leadership of the People's Liberation Army Rocket Force in 2023 is noteworthy, particularly following a decade-long anti-corruption campaign.

In the backdrop of various economic challenges, there is a growing sense of disillusionment, even among those who have been historically optimistic and loyal to the government. Repression and information control are increasingly noticeable. Therefore, the process of greater centralization is an attempt to avoid disruption. It reflects the challenges associated with the adjustment process and underscores the party's significant fear of losing control over the system.

The path to de-risking

It is noteworthy that China was ahead of the rest of the world in seeking to de-risk its economy. The focus on indigenous innovation, capability building, and holding a large share of the global supply chain are representations. Their efforts to de-risk the global payments system are also notable. Trading with Russia in Yuan, the Belt and Road Initiative, Union Pay, WeChat, and Huawei's 5G technology are all examples of de-risking in various sectors.

However, China's failure to de-risk its reliance on demand from the rest of the world is particularly significant.

Evidence suggests that China's ability to be competitive in manufacturing or its trade surplus

China's failure to de-risk its reliance on demand from the rest of the world is particularly significant.

have nothing to do with efficiency or comparative advantage. It is directly linked to large indirect subsidies and weak domestic demand.

The real estate sector in China is a proxy for what is happening at a larger scale in the country. Easy access to cheap capital acts as a subsidy. Net savers subsidize net borrowers wherein the net savers are the household sector, and the net

The United States, along with other persistent deficit countries like England, must adopt policies that reject the absorption of excess savings from surplus countries like China.

borrowers are manufacturers and local governments. The undervalued currency also acts as a subsidy, wherein the net importers (the household sector) are subsidizing the net exporters. The expansion in tradable-goods exports is a response to the property sector contraction.

In this equation, households do not have enough income to consume a significant portion of what they produce. The problems of the real estate sector will be evident in the infrastructure and other manufacturing sectors.

These large subsidies will also lead to a much larger manufacturing share of GDP in China than in the rest of the world. Globally, manufacturing is 16 percent of GDP; in China, it is 28 percent. China's share of global GDP is 17-18 percent; however, it is only 13 percent of global consumption and 31 percent of global manufacturing. The world has to adjust to this huge domestic imbalance within China.

There is an unambiguous shift in Chinese ambition to push for high-end manufacturing through subsidies, in spite of weak external demand. This shift is visible in the renewable energy sector as well as auto-exports. Such opportunities will eventually be available in the aviation sector, wherein constraints on Boeing's ability to manufacture create a potential to be compensated by Comac C919.

The United States, along with other persistent deficit countries like England, must adopt policies that reject the absorption of excess savings from surplus countries like China. It falls upon these countries to drive a transformation in global imbalances. Bilateral tariffs are not necessarily an adequate de-risking strategy. Alternative sources of supply and production are critical.

Within this context, some of India's key export sectors, such as pharmaceuticals, auto components, and electronics, rely on Chinese intermediate or

capital goods. Completely cutting off these supply chains would be counterproductive. Instead, a gradual and sustainable approach to deleveraging is necessary. The Indian government is attempting this through various schemes with varying degrees of success. However, a rapid reduction in the \$80 billion trade imbalance to just \$1 billion within a few years is not a realistic expectation. It will require significant sacrifices in key export sectors.

De-risking should not be automatically equated with positive outcomes. High tariffs, higher costs, reduced competitiveness, and a lack of innovation

De-risking should not be automatically equated with positive outcomes. High tariffs, higher costs, reduced competitiveness, and a lack of innovation are trade-offs that have to be balanced in this bid.

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China is well aware of its dependence on foreign technology, and the fact that those dependencies can be used against it. The US sanctions on Huawei confirms its pre-existing policy of seeking an indigenous semiconductor sector.

It is puzzling why China is enthusiastic about attracting foreign capital. It can be suggested that it is more about appearances than practical necessity. China views international capital markets as a symbol of being taken seriously. China's demand for foreign investment in leading-edge sectors is also dedicated to strengthening the country's domestic champions. Its need for foreign capital is minimal. For a developing country, foreign capital is useful for overcoming savings constraints, fulfilling high investment needs, and introducing new technology and management techniques. However, China is not a capital- or savings-constrained economy.

The current negative foreign direct investment (FDI) flows suggest foreign companies are withdrawing money from China. This might not necessarily mean they are selling their domestic factories but rather taking advantage of higher interest rates elsewhere. In the past, there was a financial benefit to keeping corporate cash in China due to higher RMB interest rates compared to dollar rates. The shift in cash out of China could also signal a lack of confidence among foreign investors, potentially influencing domestic-investor confidence as well.

Military advances

China's economic progress is accompanied by advances in its military might. The People's Liberation Army (PLA) has undergone the most comprehensive military modernization in the history of mankind. A combination of ballistic, cruise, and hypersonic technology, their rocket force is far more sophisticated than any other adversary. The lack of such sophisticated missile defenses in India is a cause of concern for both India and the United States.

The Chinese strategic support force was the first in the world to proactively integrate space, cyber, and electronic warfare. It is their primary instrument for AI enablement. When Chinese officials discussed "intelligentization" five to six years ago, they were already considering the incorporation of AI.

Currently, there is only an assessment of the size of the Chinese military force and not their performance since they are yet to be tested on the battlefield. Without an accurate assessment of performance, there is a problem of uncertainty. In the event of conflict escalation, the Chinese, their allies, and their adversaries will all be taking uncalculated risks. This increases the need for restoring deterrence.

There is an emotional aspect to the Chinese leadership's claims on Taiwan. The issue at hand extends beyond a mere question of sovereignty. It also encompasses China's aspiration to assert itself as a global focal point by the year 2047, juxtaposed with the complexities it encounters in governing specific islands.

The most peaceful and pragmatic solution for Taiwan may paradoxically lie in non-resolution. Attempts to resolve the Taiwan matter are accompanied by greater risks. This necessitates the formulation of a policy that maintains an unsatisfactory status quo for all parties involved—China, Taiwan, and the United States.



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Strengthening Trade Ties: India, US, And Global Supply Chains

In the backdrop of the cost differential offered by various countries vis-à-vis China and the tariff policies imposed by the United States, dream trade and trusted geographies have become a trending subject. Security, resilience, reliability, and accessibility have become critical factors in preparing supply chains for a “just-in-case” scenario. The focus is on trade alliances with mutually acceptable norms, transitioning from mere value addition to value system formation.



Creative thinking is needed in the bilateral trade relationship.

The US government has stated its intent to reshore, nearshore and friendshore. Simultaneously, the conversation around the China Plus One diversification strategy has shifted from identifying India as an alternative location to a viable first choice. It stands out as a strategic market due to innovation, talent, comparative cost advantage, and superior quality of products.

In this context, a Free Trade Agreement (FTA) between India and the United States is a long-standing subject of discussion. Some experts suggest that there is little correlation between FTAs and actual growth in trade. The exponential trade growth between the US and Vietnam is an example. Similarly, the US does not have FTAs with the United Kingdom, the European Union, or Japan, and that is not a hindrance to trade. In comparison, its FTA with Australia has led to issues with legislative provisions around friendshoring. The lack of a clear definition of 'friends', where an FTA ends up being equated with friendship, further complicates the issue.

Two contextual factors merit attention. First, trade between China and the US is highly cluttered. Second, the extent of possible trade under the standard WTO rules should not be underestimated. Therefore, the India-US trade relationship has powerful opportunities to grow even without a trade agreement. There are no real, short-term prospects for a deeper trade relationship if it is to be defined by a formal agreement. Furthermore, any agreement that is to be politically viable will be cluttered.

A counterargument suggests that trade agreements ease movement, allow nations to strengthen their strategic relationships, build information symmetry, and increase investor confidence. Vietnam's FTAs with 16 major economies have reduced barriers for low-margin commodities as well as countered Chinese manufacturing.

Reshaping bilateral trade

The India-US bilateral trade growth is driven by large domestic demand, the need to build supply resilience, and India's e-commerce potential. Both governments have established sufficient trust frameworks for industry to operate, which has enabled the ongoing move to manufacturing, an enhanced natural progression from thirty years of

collaboration in design engineering. It is a welcome move as both countries are dependent on China for electronics and generic pharmaceutical supply chains, and the US market is exceptionally open to Indian products in these sectors.

There is opportunity to do more through the removal of value and commodity restrictions, better airport infrastructure for cargo, setup dedicated express terminals, and facilitation of trans-shipments. Building supply chain visibility through data and technology is also pertinent. This includes real-time tracking of shipments, development of high-level monitoring and intervention tools, and optimization of network systems to account for external factors like extreme weather and geopolitical disruptions. India's large ecosystem of startups and academic institutions like the IITs can lead research and development in this area. Academic institutions in the US can also support this bid.

Creative thinking is needed in the bilateral trade relationship. Establishing trade zones, rather than completely revamping the system, could be beneficial. This approach would mean getting rid of regulations in these zones to promote collaboration and focusing on areas like semiconductors and artificial intelligence.

While global multinationals have played their part in the growth of the India-US relationship, in India the proportion of active startups is fairly thin in critical technologies like cyber security, quantum, and semiconductors. Steps must be taken to improve this.

Domestic policy reforms and future growth

India's ambitions have to extend beyond being a 'plus one'. It has to strive to be a critical piece in the global value chains (GVCs). While it has been demonstrated that scale in manufacturing is possible, this potential has to be harnessed in developing competent ecosystems, capital goods capabilities, and integrated design solutions. The focus has to be on two to three core sectors,

India's ambitions have to extend beyond being a 'plus one'. It has to strive to be a critical piece in the global value chains (GVCs).

greater inclusion of all states, and promotion of low-cost digital solutions. Reforms in identified growth sectors within India's GVCs have to be prioritized.

Indian financial systems have to be integrated with its ambitions as well as global financial markets. India will also be required to generate capital account convertibility, enable greater movement of people, and facilitate ownership of assets. Investments have to be decluttered at a global level.

At the national level, it is imperative for India to maintain a prudent fiscal policy and strive for credit rating upgrades. Tax policy reforms, encompassing both indirect and direct taxes, need to remain a focal point. Given the passage of seven to eight years since the implementation of GST 1.0, it is crucial to evaluate the landscape for GST 2.0 and direct tax reform. These are key areas that require the attention of the Union government.

The Gati Shakti master plan, national logistics policy, push for multi-modal infrastructure, and a multi-jurisdictional framework to ease clearances are steps in the right direction. Ambition levels in India should be higher. The onus of ease of doing business is on the subnational governments. States like Tamil Nadu, Gujarat, and Uttar Pradesh should move beyond interstate comparisons to compare themselves with countries like Vietnam.

Indian cities can be drivers of economic growth. Mumbai, for instance, is in line to become a global financial center. The plans include increasing the GDP of the Mumbai region to \$1.5 trillion. Several interventions are required to unlock the potential of India's cities, including increased land availability and the ability to harness financial resources effectively. The strengths, weaknesses, endowments, political aspirations, and industrial and business drivers have to be analyzed to implement effective policy measures. Most importantly, intent has to be backed by actual commitments.

There is potential for India to focus on Application Programming Interfaces (APIs), medical devices, and chemicals. It can be a pioneer in developing an agri-stack, urban-stack, and several other initiatives in this domain.

As India moves past the challenges of access to basic necessities, the coming decades will bring new set of challenges, including avoiding the middle-income trap. There are challenges of lack of policy predictability, logistics, large-scale manufacturing infrastructure, and ambiguous direct

and indirect tax policies present challenges. In order to maintain competitiveness, specific barriers, potentially down to eight-digit Indian Trade Classification Harmonized System (ITC-HS) codes, have to be identified and presented to the government for tariff adjustments.

To efficiently participate in global value chains, India's skilling sector also has to be decluttered. There is a need for aggressive action to bridge the gap between current conditions and desired reforms. In particular, this includes land and labor reform as well as sustainable transition to ensure long-term energy security. While carrying out these reforms, political sensitivities also have to be acknowledged.

India is bestowed with an abundance of mind and muscle, as well as the ability to make, mine, and manufacture. The future of India will be built on the active participation of Indian companies in global supply chains. Another trend that will contribute to de-risking is the gradual decline in China's population. With two successive years of population decline in 2022 and 2023, projections indicate that China's population could halve to 700-800 million within 70 years. This demographic shift will likely lead to labor shortages and increased labor costs in China. Consequently, both multinational and Chinese companies may need to relocate out of China to address these challenges. This scenario will be advantageous for India, given its young demography and unique strengths.

Balancing Security and Investment

On a global level, de-risking is proceeding relatively slowly. The inherent challenge to de-risking is the incomplete mitigation of risks unless trading between different blocs ceases to exist. Currently, such a transition cannot take place. Trade deficits are primarily found in big democracies like the US, UK, and India. Trade surpluses, especially with the crises in Europe following the Russian invasion of Ukraine, are mainly found in big autocracies such as China, Russia, and Saudi Arabia. As trading occurs between them, self-sufficient blocs are a distant idea.

De-risking efforts have to be focused on individual sectors and progress has been made in identifying the necessary policies. How this reorientation is fashioned will be critical. A balance has to be struck between security and investment considerations. Another factor that has to be considered is the case of re-risking rather than de-risking is particularly significant in the push for renewable energy, as the

minerals required for transition are primarily processed in a single country, and efforts to reduce dependence on that country paradoxically increase risk in the renewable energy sector. In India, engineering and R&D infrastructure have transitioned from back office to value-adding IP generation over the past three decades. However, manufacturing still requires a long lead time due to the scale and complexity of the inputs required. For instance, in the semiconductor sector, for a large company to shift operations, at least three to four other vendors also have to see economic viability in the move. India's progress is in its early stages, with positive signs in policy, talent, capital, and strategy.

The investments needed to ensure multiplicity of supply are yet to begin. The current moves should be characterized not as de-risking, but as avoiding new sources of risk. Current US policies are an effort to avoid creating dependencies on China.

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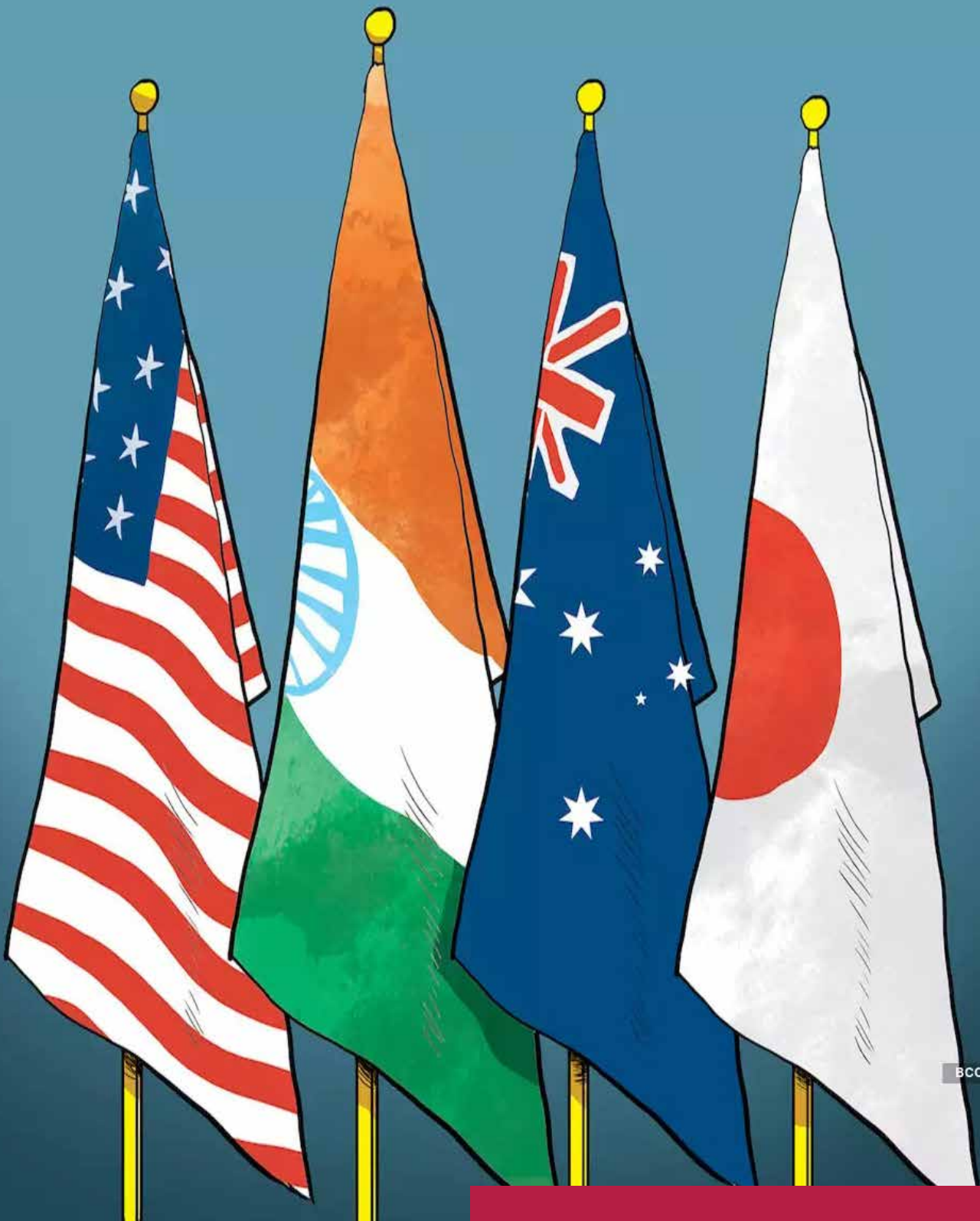
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The Quad: Navigating Strategic Dilemmas And Enhancing Cooperation

It is widely recognized that the Quad is a signature accomplishment for all four governments—Australia, India, Japan, and the United States. It has been effective in building habits of regular dialogues for cooperation. In the last five years, the framework has been reinvigorated with a clearer agenda and a greater acceptance of the Dialogue for regional architectures.



As discussions evolve within the framework, several dilemmas emerge. These include discussions on whether to deepen or broaden the agenda, prioritize security or development, and expand membership or maintain the current composition.

Navigating these dilemmas requires a delicate balance between adaptation to changing circumstances and preservation of the Quad's current embryonic state. Hardcore security challenges are better suited for security treaties and thus lie beyond the scope of this group. The priority is to ensure effective delivery of current commitments, especially towards smaller states.

While the Quad is not open to increasing its number of members, it is engaging with countries in an ad hoc manner.

While the Quad is not open to increasing its number of members, it is engaging with countries in an ad hoc manner. The group should find areas of collaboration with Pacific Island countries, ASEAN nations, and partners in the Indian Ocean. The agenda and stakeholder engagement should be flexible with the aim to consolidate. The inclusion of academia and industry, beyond G2G, to implement the work of the Quad can be a useful approach. The four members should also be conscious of the way in which Quad's development is perceived in the region and the comfort with the pace of this development.

The China Challenge

The Quad's reinvigoration in 2017 was a result of greater strategic clarity on the China challenge, that is, the need to engage with China while at the same time resisting its hegemonic policies. The US pushes for direct engagement with China to avoid miscommunication and unintended escalation. This is accompanied by a real-time briefing to India, Japan, and Australia.

Recognizing the value of engagement, Australia, too, has attempted to stabilize its relationship with China. Simultaneously, the Australian government is prepared to call out China's rapid military modernization which is happening without strategic reassurance in public. For India to engage with China, its long-standing territorial disputes and the 2020 border clashes need resolution first.

The forms of engagement with China may differ among Quad partners, but the long-term strategic goal remains the same.

The forms of engagement with China may differ among Quad partners, but the long-term strategic goal remains the same. This includes an attempt to address a wide range of issues, including economic coercion, increased basing, and the conversion of infrastructure ports to strategic assets. The aim is to strengthen each member's diplomatic position, call out violations of the rules-based international order, and solicit support from countries in Asia, Pacific Island countries, and countries in and facing the Indian Ocean.

In order to compete with Chinese initiatives such as the Global Security Initiative, the Global Development Initiative, and the Global Civilization Initiative, it is strategic for the Quad to deliver for the Indo-Pacific countries. The delivery of COVID-19 vaccines, quality infrastructure projects, and effective disaster relief are relevant examples. The Quad partners can work together in international organizations to increase awareness about the pitfalls of Chinese initiatives and offer alternative frameworks. Narratives should be supplemented with concrete action.

There is a general acknowledgment that the Quad does not want the Indo-Pacific countries to make a choice between them and China but it strives to offer them a better choice. This approach is based on providing concrete alternatives characterized by openness, transparency, economic viability, and sustainability of debts. They will have a choice between authoritarian policies such as the Belt and Road Initiative (BRI) versus quality infrastructure projects based on principles. India and Japan's work in Sri Lanka is a use-case example of the same. Similarly, Australia's economic assistance to the South Pacific, which is four times more than any other country in the world, is yet another example. Rather than imposition, the approach is to craft responses according to local context.

The dramatic shifts in the external orientation and reversal of policies in countries like the Maldives and the Solomon Islands have to be dealt with through this approach. Preemptive discussions, complimentary efforts, the exchange of assessments, and long-term partnerships should be prioritized.

Quad is not a defense pact, but it facilitates trust-building that will assist against security threats in the future. In the event of a Chinese attack on any of the Quad members, the other three would exercise caution. While the particular character of the incident and the surrounding circumstances will dictate the situation, in such a scenario, the members are most likely to be each other's first choice for engagement. Enhanced cooperation has strengthened the ability to function effectively on individual, bilateral, and trilateral levels across the four countries.

Quad's approach to mutual defense is also through the establishment of a common operating picture along with other like-minded actors and the development of a common surveillance mechanism for deterrence. The increased complexity of maritime domain awareness through the expansion of single-service exercises to tri-service exercises and the introduction of Malabar naval exercises are pertinent examples.

Quad's approach to mutual defense is also through the establishment of a common operating picture along with other like-minded actors and the development of a common surveillance mechanism for deterrence.

The Quad agenda should not be misconstrued as being anti-China. It has immense potential to expand its efforts in the technology sector, deliver on existing promises within the region, increase engagement with the eastern coast of Africa, enhance private sector involvement, promote norm-building and standard-setting, bolster maritime domain awareness, and further develop capabilities to address monitoring challenges. Additionally, it can focus on training and capacity building for counterterrorism among its Indo-Pacific partners.

The Quad process has established a degree of comfort that is facilitated by regular communication and stocktaking in domains of maritime security, connectivity, telecommunication, critical technologies, education, and infrastructure. As the ease of conversation displays concrete outcomes

and the big picture is more aligned, the systems should work even more closely to build a culture of enhanced cooperation.



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Bridging The Divide: Strategic Cooperation In West Asia

In the recent past, the major tectonic shift from bilateral to trilateral, plurilateral, and mega-regional forms of cooperation has been particularly significant. This is exemplified by the launch of the India, UAE, Israel, and the United States (I2U2) initiative and the India-Middle East-Europe Economic Corridor (IMEC), which has reinvigorated cooperation within the region.



The launch of these initiatives displays an ambition to chart new corridors of trade and formulate a global response to Chinese connectivity initiatives. They also demonstrate the beginning of normalization between Israel and the Gulf States (which has, however, been complicated by the war in Gaza) and a convergence of efforts to deal with Iran. These initiatives are pivotal for India's connection to West Asia, as they aim to trigger a large-scale movement of capital, technology, and people. In addition, they hold the potential to develop alternative supply chains in sectors such as health, food, fuel, and fertilizers.

Three alignments dictate the IMEC: India and West Asia; the Arab world and Israel; and the Middle East and Europe. It is pertinent to recognize that these alignments may not move at the same pace and are dependent on normalization and peace in the region.

Challenges Amidst Regional Instability

The negotiations on the IMEC and I2U2 happened in a relatively stable atmosphere; however, the war in 2023 has raised questions over their viability as well as the strategic and logical underpinnings. In addition, an avalanche of low-intensity conflicts taking place across borders has further destabilized the region. Iranian strikes into Syrian territory, Israeli assassinations in Beirut and Damascus, Iranian counterstrikes in Herbel, and Houthi disruption in the Red Sea are pertinent examples.

Iranian fingerprints are evident in several of these

Iranian fingerprints are evident in several of these events. It can be argued that rapprochement efforts with Israel attempted to marginalize Iran's presence in the region.

events. It can be argued that rapprochement efforts with Israel attempted to marginalize Iran's presence in the region. Reinforcing the notion that Iran will continue to play the role of a spoiler, project their regional dominance, and exert deterrence through support for non-state actors such as Hezbollah, Hashd al-Shaabi in Iraq, and the Houthis in Yemen. The October 7th attacks have also re-centered the

Palestine issue, with Hamas signaling that the matter cannot be sidelined.

While these new initiatives may eventually foster peace, it is highly unlikely that Israel will be open to any mediated solution after the devastating terror attacks. The current government has rejected the two-state solution. At the same time, neither Israel nor the US seem to have adequate responses to these non-state actors, especially with the kind of weapons capabilities they seem to have acquired.

As a result, any attempts to stabilize the situation raise several issues, including the lack of a credible interlocutor on the Palestinian side, who will fund reconstruction in Gaza and the stability of Israel itself. Israel's participation in these initiatives is critical. Its technology in food production, irrigation, urban waste management, and the outer space holds immense potential for cooperation. While conventional wisdom suggests that Gaza will remain a source of deep instability and frustration towards Israel as well as proxies like Hezbollah. An unconventional scenario demands much more from the Gulf States. The Arab states possess the wealth to transform Gaza and the West Bank, but they have so far not shown the will to do so.

More recently, Indian diplomacy has actively engaged with both Israel and the Arab world, receiving a warm welcome from both. In the past, the Palestine question had restricted India's ability to optimize the potential of its relationship with West Asia. As India moves past these challenges and reconceives its strategic geography, there is potential for it to be an interlocutor in the region.

Minister Jaishankar's visit to Iran in January 2024 was significant for discussions on the Chabahar port, enhancing connectivity, and stabilizing supply chains and maritime commercial activity in the Red Sea and Arabian Sea. India can play an important role in the Global Gateway Forum as well as in the Partnership for Global Infrastructure and Investment (PGI) to facilitate trade, connect India's infrastructure development on a global level, and promote entrepreneurship.

India-US Strategic Alignment

There is unity of vision between New Delhi and Washington, where the I2U2 and IMEC initiatives are seeking to create a viable alternative but are not necessarily being undertaken as an anti-China effort. The comparison between IMEC and BRI is an erroneous one, as the latter focuses on China's singular growth while the former focuses on multiple growth engines. States such as Saudi

There is unity of vision between New Delhi and Washington, where the I2U2 and IMEC initiatives are seeking to create a viable alternative but are not necessarily being undertaken as an anti-China effort.

Hydrogen, the One World, One Sun, One Grid initiative, and the US-UAE Partnership for Accelerating Clean Energy (PACE) are examples of the potential for collaboration.

Arabia, the UAE, and Greece remain deeply committed to the potential of this alternative.

The US-India strategic relationship itself has come a long way since the nuclear impediment, where conversations now include regional cooperation and multi-stakeholder engagement. This is accompanied by a change in the character of commerce between India and other IMEC countries. For instance, in 2000, India's export basket to Saudi Arabia was valued at \$850 million, which has increased to \$8.7 billion in 2022.

India's evolving strategic role, alongside the rise of global Indian companies, underscores their potential as strong partners for the American private sector. Within the US government, the Development Finance Corporation's (DFC) largest investment portfolio is situated in India, including significant projects such as the recently inaugurated solar project in Tamil Nadu. The DFC's influence also extends to other regions like Sri Lanka, where it is partnering with Adani Ports for the Colombo West International Terminal Pvt. Ltd. (CWIT) project. This exemplifies how economic relations are being reshaped by Indian companies that emulate the behavior of global American companies, seeking opportunities worldwide without being tethered to their headquarters' location.

Energy transition is another point of commonality between these states. The energy transition that is anticipated in the coming decades, will significantly reduce crude oil shipments globally, accompanied by a surge in electron transmission, critical mineral extraction, and clean hydrogen production. This presents a highly lucrative opportunity, especially for the US and India, to strategically advance the technology agenda driving this transition. Strengthening partnerships between American companies and influential global Indian corporations such as Tata, Adani, and Reliance, is paramount. Their eagerness to collaborate with American counterparts is also evident, along with the potential to leverage capital from Gulf regions. Green



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Quantamania: Rules for an AI World

AI is a nascent industry. AI must be leveraged without running into overwhelming legal challenges.



North-South Divide

There is a North-South divide in approaching AI. Countries in the global North, such as the US, have taken a risk-centric approach to creating rules around AI. On the other hand, the AI community in India, and much of the Global South, has approached this technology as an opportunity to extend empowerment.

There is a need to reconcile these two approaches, to not discard important risk considerations while allowing space to leverage AI for public good.

China is currently behind the West in developing AI models. However, it continues to be a serious competitor. Chinese mobilization of the economic and political system, along with their Civil-Military fusion, will allow them to catch up fast, even if the Chinese models look different to the current Western ones.

Chinese investments across the board in critical technologies make them a serious challenge in the coming 5-10-year period. From 2025 to 2030, most of the world's data can go through Chinese-made infrastructure.

There is a pressing need for a US-India strategic technology partnership. Over the next five years, the India-US partnership will have to focus on exploring the space realm for opportunities to test and deploy AI models, bringing investments in hardware to relieve current hardware supply chain dependencies in chips, drones, and robotics, and ensuring cooperation in the Lethal Autonomous Weapon Systems (LAWS) space.

India and the US converge as partners in democratic principles that neither can risk while weighing the opportunities of AI.

India US Strategic Technology Cooperation

The India-US cooperation lacks a sense of urgency. There is a pressing need for a US-India strategic technology partnership. Over the next five years, the India-US partnership will have to focus on exploring the space realm for opportunities to test and deploy AI models, bringing investments in hardware to relieve current hardware supply chain dependencies in chips, drones, and robotics, and ensuring cooperation in the Lethal Autonomous Weapon Systems (LAWS) space.

India and the US converge as partners in democratic principles that neither can risk while weighing the opportunities of AI. The AI systems that this partnership builds can benefit the needs of the Global South through its democratic processes. Democratic processes, however, are slow which gives non-democratic AI models an edge in mobilizing resources and catching up.

The two countries can also leverage the China challenge to gain in talent, software, and educational opportunities. They can also provide alternatives to Chinese models and set a framework for AI in the coming decade.

In the last 10 years, China has built clear strategies, amassed resources, and identified national AI champions that they can deploy globally. The release of their AI models in 2023 indicated their transformative potential in the economic, societal, and national security space.

The US established the National Security Commission on Artificial Intelligence in 2018 to combat Chinese competition in the AI space. In recent years, the US has taken further steps in this regard. The White House passed an executive order to move departments and agencies to scale up the adoption of generative models and build the regulatory framework around the use of these operations. The latter was supported by a bipartisan Congressional push on providing a regulatory framework.

There are complaints in the United States that AI models are becoming too expensive, which will impact access of small- and medium-sized companies. The US is testing a National AI Research Cloud, which is a consortium of universities with tools access to Cloud. Legislation such as the Create AI Act of 2023 has been brought to fund this initiative.

AI Frameworks for Democracies

But the current moment is not just a geopolitical contest between the US and China, but a transformative moment in the way democracies are organizing themselves around platforms that are emerging from AI.

The current generative models may have come from US-based companies, but the release of open-source models can be leveraged by emerging nations to invest resources and get ahead in the geopolitical space.

There are three elements to AI: data, algorithms, and computational power. India has AI-skilled manpower and large datasets but lacks compute capabilities, which are concentrated in select companies and countries.

Capabilities, Costs and Competitiveness in India

80 per cent of the cost of AI innovation is in compute capabilities. The compute required for the newer models is doubling every 6 to 10 months and the space is witnessing a massive concentration of capabilities. Through the iCET program, India and the US have been working together to ensure that the Indian government and private actors have access to chips that are being developed across the world, which are making AI compute easier and faster.

The focus of the Indian government will now be to democratize access to compute to leverage the Indian data mine, ensure skilling and reskilling, and build a proper data-governance framework.

Generative AI will be uniquely leveraged in India, and the country needs to play with the full stack of AI to develop local capabilities. There are multiple private sector and start-up efforts that are building models which offer unique Indian solutions to challenges that are unique to India. This speaks to the potential of Indian large language models and attracts equity investors. The challenge is to bring these models to the mass of the people and to build solutions in Indian languages.

India will need to develop its stack with investments that enable frugal innovation and business models that will allow newer startups to invest in developing compute infrastructure.

India's Semiconductor Mission has provided incentives for chip manufacturing. Competition in compute capacity in India should drive down prices over time. It will require significantly increased investment from the government and private actors

to compete with the best chip-manufacturing companies in the world. India's aim currently is to produce 28 nm chips.

The current data piles for training AI models have been exhausted, and there is a need for better data to train these models. The data generated by automated vehicles, for instance, can be very useful for AI model training. China stays ahead by deploying new vehicle models, since they control the entire spectrum of the supply chain.

India is not operating at the scale of China and requires building alternatives for full stacks to the current dominant players in the market. While India has a large data exhaust, the data to train large language models in Indian languages is very small. India must get creative in generating this data and create the right regulatory framework to support this. These research clusters can also be made available to friendly countries in a spirit of cooperation similar to that between the US and India.

Investments in Indian language models are already being made. The advantages of these investments can be distributed by creating interoperable frameworks and open data sets such as the US AI Research Cloud.

Trusted partners, such as India and the US, can also benefit from extending these models across borders and plugging into each other's AI research data sets.

AI will take jobs with the 4D Rule, that is, Duplicate, Delicate, Dirty, and Dangerous jobs can be replaced by AI. Both in India and the US, there will be a co-piloting phase with AI models as early adopters



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Delivering for the Global South: Digital Public Infrastructure (DPI) and a Trusted Tech Future



The Indian model of DPI followed a framework structured around the question: what solutions will it offer?

Private and public sectors were brought together to build the skeletal framework which is the India Stack. The government created the foundational layer, and the private sector built the innovation layer. These layers were deployed with a trusted partner to bring technologies and transparency in the partnership ecosystem. The final step of the runbook was for the government to consolidate the technology and policy space.

US-India alignment will be necessary for delivering DPIs globally. Defining standards and creating a common regulatory framework and norms for the provision of digital public goods to the international community is central to the partnership. This will allow the partnership to work with other partners in a variety of sectors such as healthcare, agriculture, payments, etc.

These frameworks must be democracy-affirming to catalyze both public and private sources to help create digital infrastructure locally and globally. The partnership can create a safe and trusted DPI architecture that can be exported to the Global South, building transparency and open-source digital solutions to democratize DPIs.

DPI platforms offer startups an easy plug-and-play model to start operating and connecting with customers. Foreign startups and investors have apprehensions about data ownership. Building DPIs on blockchain can assuage these concerns. An additional concern with US-based companies is the dilution of market forces. Startups will have to find business models that work at the large scale of DPIs.

Indian DPIs are different from Chinese investments as they do not create rent-seeking patterns and have no back-channel doors into the political and economic institutions of partner countries.

In India, DPIs created by private actors on government-developed platforms go through a range of democratic processes of scrutiny. This model is applied to all spheres, and trust is built up because the society at large accepts the checks and balances that any democratic system and operational market forces bring to DPIs. The model further creates standards for security and transparency, as they are adopted by partners.

The Global South lacks the talent to localize DPI solutions. There is a need for mass skilling of talent pools to develop these models in the local context.

India too, faces a lack of skilled talent for DPIs; however, the developed software industry is adopting DPIs to address this challenge. India-US data governance models will help in creating trust in the supply chain for partners to focus on local skilling.

Global convergence is emerging among partners in the West and some parts of the Global South in areas such as data-protection regimes, allowing for interoperability among platforms and solutions. India can scale the technology exchange between the Global North and South.

People-to-people connections are also helping create trust between tech partners in India and the US. The two countries see increasing convergences in values, leading to massive bipartisan support for India in the US.

The capitalist merits of the India-US exchange create a win-win scenario for business, along with increasing geopolitical convergence between the two countries as trusted partners in the security

The capitalist merits of the India-US exchange create a win-win scenario for business, along with increasing geopolitical convergence between the two countries as trusted partners in the security sphere.

sphere. This allows for venture capital to flow between the countries and create synergies. Countries such as Israel could become important partners in these synergies. The One Future Alliance gives India an avenue to deal with some of the issues related to inclusivity and addressing the digital divide, particularly with regard to gender, which is acute in the Global South.

The Joint Task Force on Open Radio Access Network (O-RAN) is a good starting point for the partnership. Telecommunication and mobile network accessibility form the core of DPI deployment and creating models and services. O-RAN can democratize network access so that users are not bound to standards or proprietary technology. The O-RAN task forces can ensure this accessibility while creating frugal solutions.



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iCET: Well Begun, But Challenges Lie Ahead

In just a year, the US-India Initiative on Critical and Emerging Technology (iCET) has gone from being an idea to becoming an organizing principle of the India-US bilateral relationship. Now, there is no Forum that meets bilaterally without some tangent that connects it to the iCET. This demonstrates the centrality of the technology conversation in this relationship and the enormous untapped potential for mutually beneficial technological cooperation.



At a time when demographics, markets, and policymaking in India are coming together in a sweet spot of growth, technology can turbocharge this process to the benefit of both US and Indian entities.

DTTI to iCET: A New Leaf

This bilateral conversation under iCET is not a new one, but previous attempts have been unfulfilling. In the past, this conversation happened via the Defence Technology and Trade Initiative (DTTI) which was government-led, while iCET is government enabled but private-sector-led. The strategic framework has evolved since the days of DTTI with increased alignment at the top leading to a broader buy-in by all stakeholders on both sides, which is responsible for the recent breakthroughs. Sustaining this momentum across several domains will require constant advocacy.

iCET is a framework to enable technology to go beyond pure supply-chain partnerships driven by labor, and instead aims to promote outcome-oriented technology collaboration by facilitating greater technology sharing, co-development, and

An aspirational example would be for India to not just increase iPhone assembly, but be the design and production home for next-generation Apple products.

co-production opportunities. An aspirational example would be for India to not just increase iPhone assembly, but be the design and production home for next-generation Apple products.

The launch of iCET between India and the US in January 2023 led to calls for similar partnerships from more of India's close partners. India, the US, and the Republic of Korea announced the launch of a trilateral initiative on critical and emerging technologies in March 2024. Greater cooperation among like-minded countries on these subjects is a net positive that will help to embed the footprint of iCET more effectively.

First Year: Defence, Space, Telecom, Cyber

There has been a significant progress under iCET in its first year. Under the defense pillar, the technology transfer arrangement for joint production of General Electric's F414 engines with Hindustan Aeronautics Limited (HAL) has set a benchmark. The launch of India-US Defence Innovation Bridge (Indus-X) and the collaboration between General Atomics and multiple Indian startups on co-developing components has taken this progress further. Under the defense industrial cooperation roadmap, the two governments have begun to explore co-production of defense platforms and cooperation in certain foundational technologies which would enable development of a whole new generation of products and applications.

The space pillar has seen India's accession to the Artemis Accords in June 2023. The NISAR satellite (NASA-ISRO Synthetic Aperture Radar) mission, which was originally scheduled to launch in 2024, is now expected in 2025. There has been progress towards the inclusion of an Indian astronaut in a NASA spacecraft on a mission to the International Space Station. Greater cooperation in the commercial satellite launch space would appear to be the logical way forward, buoyed by the recently launched sub-group under the Civil-Space Working Group.

In the telecommunications pillar, an Indian telecom company, Bharti Airtel, has undertaken Open Radio Access Network (ORAN) field trials in India using American equipment. Success in these trials could potentially result in deployment of the technology in third countries and in cooperation with other Quad partners.

In the cybersecurity pillar, India and the US are now sharing threat intelligence. The counter ransomware initiative that was created with the initiative of US Deputy NSA Anne Neuberger, has now expanded to 36 nations. The two countries also have a bilateral cyber dialogue; they cooperate on this issue via the Quad and through iCET. This multi-level engagement has increased the volume of discussion but has also caused overlaps. The challenges discussed in the bilateral, plurilateral, and multilateral fora are the same. How to minimize the overlap to increase efficiency and reduce duplication of efforts, therefore, becomes an imperative.

Building Institutional Trust

Trust is a vital element in critical technology and cybersecurity collaboration. In the last two years, Indian stakeholders' trust in American companies has increased. In June 2023, the Government of India came out with a national security directive which said that any equipment connected to the Indian telecom network has to be a trusted product from a trusted source. American companies operating in India go through this process of product and source disclosures without any issues in reinforcing the trust. In addition to the Indian directive, the US recently came out with a cybersecurity certification called the Cyber Trust Mark for IoT devices, which is a welcome step for the security of the ecosystem.

Institutional trust, however, is not achieved by a few isolated actions. It needs to be built across segments, step by step, over the years. India and the US signing the Security of Supply Arrangement (SOSA) and Reciprocal Defense Procurement Agreement (RDP) were significant steps last year. India qualifying under Defense Federal Acquisition Regulation Supplement would be another step if it comes to fruition. A major step forward in a trusted technology partnership would be the development and deployment of small modular reactors.

While the progress is a welcome sign, it must be noted that growth under iCET has been limited so far to mature sectors in which the technology, products, business use cases, institutional actors, and cooperation structures already existed. Cooperation in these cases was an exercise in identifying and enabling the right stakeholders, not R&D. In fields such as artificial intelligence, quantum computing, and biotech, the cooperation is in a nascent stage with significant R&D yet to be done. There are aspects of artificial intelligence such as high-performance computing where collaboration can progress immediately if India is moved from tier three to tier one in US export controls.

In the long term, technology cooperation will rely on smooth R&D cooperation. The building blocks of a successful R&D relationship will imply fixing information asymmetries in our universities and national laboratories. At the same time, both sides will need to invest in building habits of cooperation.

Breaking Silos in Domestic Systems

While iCET focuses on co-development projects, a parallel aim should be to ensure that government, industry, and academia in both countries engage across sectors to break silos that exist within their

domestic systems, particularly between the civil and strategic domains. The categorizing of emerging technologies into individual buckets of defense, manufacturing etc., is not as important as the acknowledgment of the criticality of technologies. With the pace of innovation, this flexibility will allow for continued conversations without getting stuck in bureaucratic crevices.

For short-term collaborations under iCET, two variables need to be considered: every problem should address a unique problem statement, and the platform should support a percentage of high-risk projects that would otherwise get neglected.

Most critical technologies are under a strict control regime and hence their passage is more cumbersome. Pipelines such as Indus-X will play a major role in ensuring that collaborations between startups in India and the US are able to see dollars at the end of the innovation tunnel. For short-term collaborations under iCET, two variables need to be considered: every problem should address a unique problem statement, and the platform should support a percentage of high-risk projects that would otherwise get neglected. Ideas that pass these filters could be supported by a joint innovation fund for startups—a formalized avenue for commercializing cutting edge technology.

The government used to be the driver of innovation, but the driving seat has been taken over by industry. Technology products and services from industry are accessed by governments at scale. Some companies now enjoy the level of agency that formerly only belonged to governments. This comes with an operational risk both within and outside war zones. How these risks can be mitigated is a question for platforms like iCET to consider.

Continued Cooperation in New Administrations Will Be Predicated on Project Successes

So far, the iCET process has been driven by the two National Security Councils. In the US, that has been critical in persevering against naysayers in other agencies and branches of government. The established system could face challenges

depending on the outcome of the presidential election in November 2024. For iCET to remain, prosper, and succeed it has to be predicated on wins, which means it has to be predicated on projects.

These projects will have to demonstrate to the incoming administration how India can be a technology partner for the US to build comparative advantages over the next decade. India can offer low-cost space technology, healthcare, and telecom technology like the 4G stack, which is getting upgraded to 5G, along with cooperation in Open Radio Access Network (ORAN). Developing technology in India is much cheaper than in the US. A Zinnov study reported that every major Original Equipment Manufacturer (OEM) of the US and Europe that carries out their R&D in India saves approximately USD 100 billion. India also has a National Quantum Mission with a starting fund of INR 7,000 cr (70 bn) under the Principal Scientific Advisor's office, and has launched a National Mission on Interdisciplinary Cyber Physical Systems

What makes iCET different from previous iterations of collaborative conversations is the focus on implementation. 2023 was the year of ideas and announcements, but 2024 must be the year of implementation.

The lack of a dependable structure is the one impediment that needs to be addressed to unlock the quantum of available opportunities—a structure that can handle the load of projects and logistics while instituting monthly meetings instead of annual ones. This structure could take the shape of a management organization which is a private-cum-government-sector institution that gives continuity and monitors the projects. The responsibility for monitoring is currently being shouldered by officers who are juggling multiple responsibilities.



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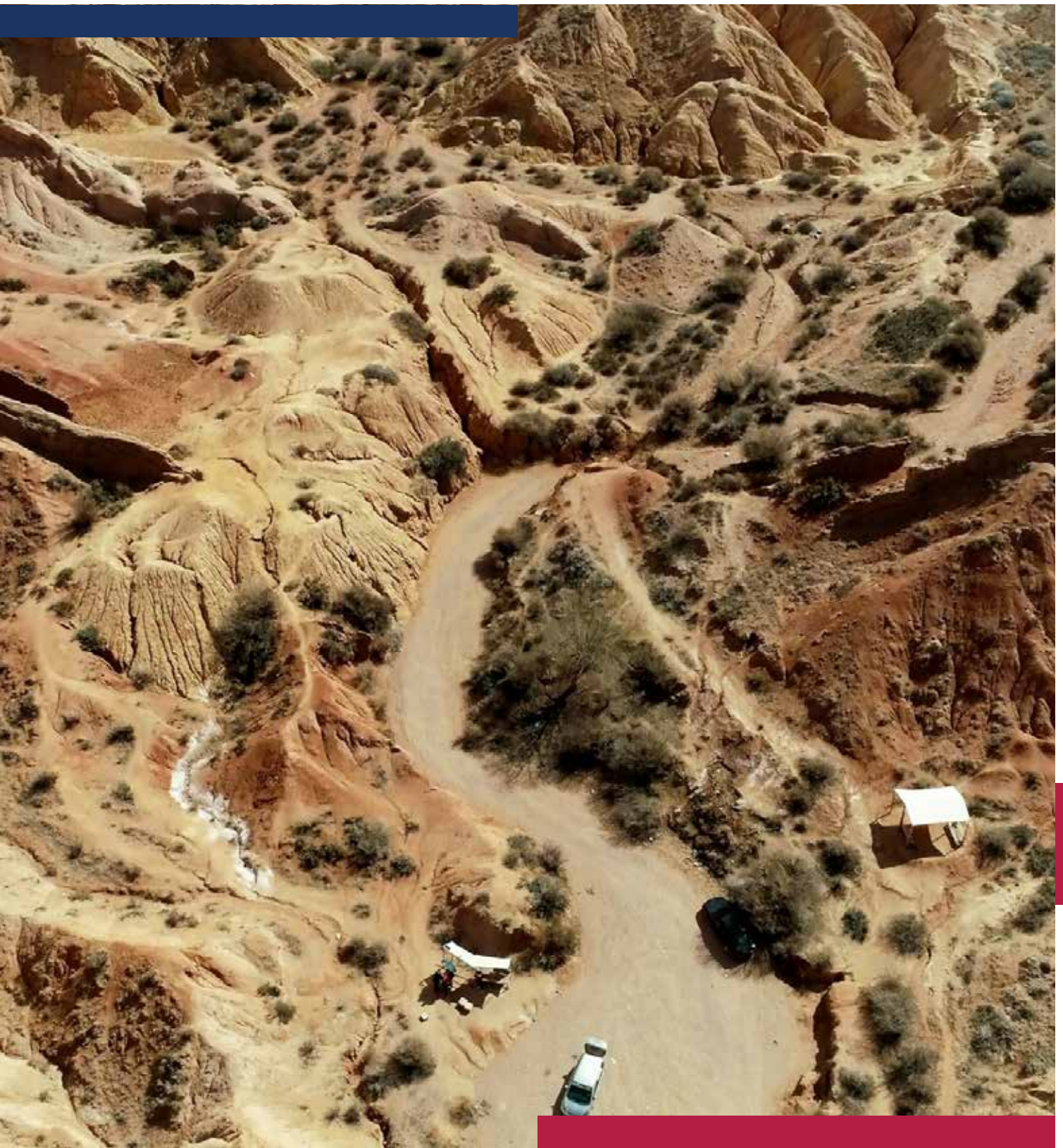
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Critical Minerals Economy: Risks And Opportunities

Over the past few decades, there has been an uptake in the discourse on critical minerals. The issues that were the domain of a few investment bankers, chemists, and diggers are now at the heart of national and economic security. In the context of China's decision to use these resources coercively, and its imposition, starting August 2023, of export controls on materials like gallium, germanium, and special graphite, there is a need to construct robust alternative structures and develop a proactive agenda. This report will discuss the risks and opportunities in this domain.



While global concentrations of supply are often discussed, what makes a mineral critical remains largely unexplored. Criticality can be evaluated through a mineral's industrial value addition and its supply risk, both of which are in constant flux. This dynamism must be factored into assessments of criticality.

In addition to supply dynamics, assessments of criticality should track changes in demand. The surge in electric vehicle (EV) demand in India highlights this dynamism. EV sales rose from 2,399 units in 2014 to 14,442 units in 2020, then to 1.2 million units in 2022–23, and approximately 1.38 million units in 2023–24. When both supply and demand display dynamism, unique coordination mechanisms have to be devised to ensure energy security.

Criticality can also be defined through the risk of weaponization, the risk of market failure, their availability to meet the challenge of the climate crisis, and the urgency that governments have attached to the pace of their energy transition.

Exploration and Data: Advancing Discoveries and Collaborations

Critical mineral exploration is a key area for India. The Ministry of Mines and the Geological Survey of India have prepared more than 100 reports on critical mineral blocks that are ready for auction. More than 200 new projects have been identified for mineral exploration in 2024–25.

India has also made 170 years of critical mineral

India has also made 170 years of critical mineral data publicly available through the National Geoscience Data Repository, information that data analytics and mining companies can analyse to make informed geological predictions regarding mineral locations.

data publicly available through the National Geoscience Data Repository, information that data analytics and mining companies can analyse to make informed geological predictions regarding

mineral locations. Subsequently, exploration projects can be funded by the government. This initiative presents an opportunity for US data companies to collaborate on the repository and support exploration efforts. India has also opened avenues of finance to R&D institutions, scientific and research labs, and start-ups.

In addition, India has recently introduced the auction of exploration rights. The earlier (2015) auction regime hindered junior miners and did not give direct extraction rights to those who discovered minerals. Instead, it mandated an auction process for mining rights. Along with exploration rights, a new exploration license has been established to facilitate this process.

If an area with potential for critical minerals is identified, an exploration proposal can be submitted to the ministry. The exploration rights for the area will then be auctioned. During the auction, junior mining companies can bid on the percentage of the eventual premium the mine would receive upon auctioning. This system provides a regular income to junior miners for their exploration efforts. India also hopes to attract junior mining companies from countries such as the US, Canada, and Australia to bid for these exploration blocks.

In the process of scaling up, the possibility of market failure becomes a central concern. While availability is often emphasized, the cost of delivery is equally vital. The proposed solutions tend to be more expensive than the existing carbon-intensive alternatives. This makes achieving the desired goals significantly more challenging. India and the US can work together to explore alternative solutions through new technology, for instance, by replacing a sodium battery with a lithium battery or the induction of synthetic graphite. The private and R&D sectors can play an important role in developing this technological capability.

The issues are compounded when neither the host country nor the interested country have processing capacities. Bilateral research and development projects for processing present another opportunity for collaboration. A research-based partnership can be based in areas such as critical minerals, energy-storage batteries, optimizing batteries for fast cycle times, longer energy retention, and easier recycling.

Indian ingenuity in getting cost structures right while adhering to the highest standards of sustainable processing is a significant advantage. At the same time, India can adopt operations and processing practices such as beneficiation and use of AI and video analytics from places such as

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Wyoming. This will support the integration of technology into the basic steps of mining and manufacturing. A three-way dialogue between manufacturers, consumers, and governments is critical to managing market fluctuations.

Recycling is another avenue for cooperation. However, import restrictions are a hindrance for India to become a recycling hub. The sheer scale of requirements for a world-class recycling facility will trigger restrictions that prevent the entry of harmful materials into India. The formulation of an adaptable legal framework with the right purpose can be helpful.

Multilateral engagement

Given these opportunities, multilateral forums can further facilitate accessibility. India's entry into the Minerals Security Partnership (MSP) as the first non-G7, non-developed country has changed the profile of the organization and provided it greater credibility. India's colonial past and current position as a focal point of the Global South will support engagement with resource-endowed countries and affirm the commitment to the delivery of benefits.

There is general acknowledgment that India's involvement in this group has surpassed expectations. The priority is to translate discussions into action. This includes the identification of specific projects with global Indian companies such as Tata and Epsilon Carbon to address existing gaps efficiently. However, this endeavour may take years due to China's first-mover advantage in this domain.

The signatories to the MSP are committed to identify gaps and mobilize diplomatic energy, trade, finance, and development resources. In addition, they are committed to making clear to producer countries the risks of Chinese offtake, and the importance of other players in the game. MSP signatories are less focused on specific projects in member countries, but hope to offer a viable and trustworthy alternative to producer countries. Given the dynamic nature of this sector, a monthly

engagement among all partners and an annual engagement at the ministerial level is needed.

In line with this, the Minerals Investment Network for Vital Energy Security and Transition (MINVEST) is an important initiative under the MSP to build public-private partnerships. India has championed two projects—one in Argentina focused on lithium, the other in Africa centered on rare earths. One of them is close to bankability, and the goal of the MSP is also to mobilize resources from the private sector and development finance agencies to push these projects over the finish line.

The Quad has a unique opportunity to counter China's overwhelming presence in lithium-producing countries in Africa, Australia, and South America. All four Quad Ambassadors can visit producer countries to promote an MSP project and enable access to critical minerals. The International Energy Agency (IEA) is developing a list of specific critical minerals that member states should stockpile to ensure security and stability in the market.

Private Sector Involvement: Investment Concerns and Risks

There is a general consensus that private sector involvement is crucial for security in this domain. A fundamental consideration for the private sector is the comfort that certain geographical regions and stable, established markets provide. Therefore, major investments are primarily in countries such as India, the US, and the UK. Private sector hesitancy stems from rapid changes in government, which is particularly evident in South America. Concerns about nationalism and possible nationalization of assets compound these challenges. While capital availability is not a problem, there is allegiance towards long-term adherence to commercial terms and assurance of protection from regulatory changes.

Joint policy development with industry stakeholders can address these concerns and ensure sustainable operations. G2G collaboration for investment

The signatories to the MSP are committed to identify gaps and mobilize diplomatic energy, trade, finance, and development resources.

protection is a step in this direction. The private sector in India can coordinate more with Indian Ambassadors in producer countries for complementary efforts to build trust. The private sector's concerns about exit strategies have to be addressed as well. For instance, change of control clauses restrict the transfer of underlying rights or assets, which acts as an impediment to investment. Flexible clauses, infrastructural support, and access to green finance will reduce the risk and cost of capital for private projects.

A recognition of interdependence in resource extraction is also critical. For instance, key minerals like spodumene required for lithium extraction come from the US. It is necessary to develop detailed policy frameworks that recognise this interdependence.

A combination of ramped-up domestic manufacturing, increased bilateral asset acquisition, and engagement with multilateral forums is crucial to achieve sustainable economic growth and reduce the dependence on imports. This strategy will not only create jobs and boost the economy, but will also enhance national security and resilience in the face of global uncertainties.



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Green Transition: Changing The Energy Paradigm

The worsening climate crisis and instability in energy markets due to the Russia-Ukraine war have created a compelling environment for climate action to become a top-tier agenda. It has dawned on the private sector that the ongoing transition is among history's biggest political and economic transformations. This recognition is fueled by both a shift in government policies as well as the profound impact of customer demands.



This is accompanied by the need to ensure supply chain security. Many companies have moved from a focus solely on energy to a broader perspective encompassing energy, climate, and natural resources. The evolved discourse around climate change now prioritizes a whole-of-economy approach.

In order to achieve major climate goals, a strong feedback mechanism with the political economy is critical. The energy transition conversation should be centered around monitoring not only exogenous

The energy transition conversation should be centered around monitoring not only exogenous economic factors like interest rates and supply chain costs, but also feedback from the political economy, and the willingness to adapt.

economic factors like interest rates and supply chain costs, but also feedback from the political economy, and the willingness to adapt.

These aspects are interconnected and crucial for the effective management of the decarbonization process.

While climate discussions often focus on national emissions reduction targets, it is crucial to explore the practical steps beyond these targets. For example, an analysis of the nationally determined contribution (NDC) target of the US reveals a cascade of goals, beginning with deployment targets for EVs, which are dependent on manufacturing targets. These manufacturing targets, in turn, rely on sourcing critical minerals and materials for batteries, cathodes, and anodes. The conversation has to address these upstream challenges and recognize their importance in achieving climate objectives.

Manufacturing and Integration Challenges

In terms of manufacturing stability, it is noteworthy that grid parts are manufactured by just three major players worldwide. These manufacturers, facing orders for the next decade or more, demand upfront payment, making customers pay not just for the product but also for the cost of capital over the entire period. This dynamic, compounded by

occasional bidding wars, puts purchasers in precarious situations, particularly affecting sectors like onshore wind. A regulatory approach is necessary to address this and provide long-term market size certainty. This is key to navigate the challenges of decarbonization effectively.

Manufacturing trends also serve as leading indicators of whether NDC goals will be met. The recent surge in battery factory announcements in the US is significant in this regard. By 2030, with 15 gigafactories planned, the country could build nearly 10 to 12 million EVs annually. This increase in battery production capacity will be crucial to determining the fate of its NDC goals.

Similarly, small and medium-sized companies often struggle to participate in the transition due to limited knowledge about technology and supply chain management. As the focus on Scope 3 or 'value chain' emissions increases, integrating these companies into the chain becomes crucial. In India, creating value chains within industries can prove effective. The automobile industry can, for example, mentor its tier one, two, and three suppliers, ensuring that buyer-seller relationships prioritize climate considerations alongside price and quality. This approach promotes inclusivity and sustainability. Additionally, establishing centers of excellence for each vertical and engaging with them on a one-to-one basis while addressing policy issues concurrently can effectively advance progress.

Expanding Electric Infrastructure

While EVs have an important role in the transition, there is uncertainty about the preferred mix of hybrid, plug-in hybrid, and battery electric vehicles. The economic considerations include a comparison of the competing cost profiles between traditional internal combustion engine (ICE) vehicles with added electric systems versus purely electric vehicles. Automakers operating in different regions will need to adapt to unique market demands. For instance, the Chinese market shows a preference for strong hybrids, whereas early adopters in the US have largely favored battery-electric vehicles.

The expansion of electric infrastructure, particularly for public transportation, is a focus area in India. Given the high population density in cities, there is a pressing need for a larger network of electric buses to alleviate congestion and reduce emissions.

Achieving a value proposition for EVs requires a more coordinated strategy, especially for transit systems. For instance, in the US, through the

infrastructure law, efforts are underway to shift the traditional diesel school buses to electric. While this supports the reduction of upfront capital expenditure, it is not the most efficient approach. A more promising approach is to migrate bus purchases to an 'as a service' model. This not only offers a standalone value proposition but also opens up opportunities for partnerships with investor-owned utilities in the US. By integrating buses into this model, utilities can monetize vehicle-to-grid attributes, such as providing ancillary services to the grid. Transit systems can explore purchasing arrangements that embrace such service-based financing and, as a result, leverage partnerships with electricity providers. This also facilitates the integration of renewables and other decarbonization efforts, as well as aligning various value streams for a more sustainable outcome.

Charging infrastructure has to expand exponentially to support the levels of EV penetration required for fleet decarbonization. While the advantages of hydrogen in heavy-duty applications are established, the primary hurdle continues to be the lack of charging infrastructure. Heavy-duty vehicle manufacturers in the US, such as Daimler, Navistar, and Volvo, along with other international companies, are resistant to EVs due to the required grid modifications. Therefore, the rapid scaling of modular electrolyzers that can utilize grid power to produce hydrogen is crucial for accelerating adoption. In this expansion, the key question is whether to opt for distributed electrolyzer infrastructure or centralized production with piping, each of which presents its own infrastructure challenges.

Additionally, it is essential to establish a global architecture with standardized rules for what constitutes green hydrogen. The policy in India, for instance, may not align with European standards for green hydrogen. Such discrepancies create islands of regulations around hydrogen, severely limiting the development of a hydrogen economy and supply chain.

Opportunities Amidst the Inflation Reduction Act (IRA)

Amidst the regulatory landscape, initial doubts around the US Inflation Reduction Act (IRA) now manifest themselves as opportunities for investment and growth. While some governments remain hesitant about change, international companies have forged ahead, actively investing in the US. Significant investments over the past year include the establishment of solar manufacturing

firms from around the world, and Hyundai's large-scale deployment of EVs. This shift aligns with similar policy reorientations in other countries, all geared towards a rapid clean energy transition. The IRA's durability amid potential government changes is a pressing question. It is pertinent to recognize that the deeper a policy embeds itself in the economy, the more difficult it becomes to reverse

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it. Notably, the IRA has not only attracted foreign investments such as Korean ventures in the US, but has also catalyzed tangible domestic developments such as the production of solar panels and batteries nationwide. This has generated jobs and revitalized local economies, evident in the reuse of abandoned coal plants as renewable energy hubs. These investments have become integral to the real economy, rendering policy reversals difficult and fostering political resilience around the IRA's objectives.

However, it is crucial to acknowledge the broader influence of leadership on energy transition initiatives. While the IRA serves as a pivotal component, changes in smaller regulations, such as liability laws for carbon capture or rules around green hydrogen, can significantly shape the trajectory of the transition. Often overlooked, these finer details play a crucial role alongside the hard economics addressed by the IRA.

Nuclear energy holds significant potential to advance the Net Zero goal. In India, projections indicate that there is a need for over 200, possibly 230 gigawatts, of nuclear power compared to the current capacity of 6.7 gigawatts. This necessitates a 30-fold increase in nuclear capacity over the next 45 years. Nuclear energy has to be approached from three angles: technology selection, partnerships for manufacturing and supply chain, and financing. This requires rapid capacity-building. While pressurized heavy-water reactors (PHWRs)

remain India's mainstay, rapid deployment must avoid technology substitution. Instead, an amalgamation of technologies can support this bid. Similarly, possible liability issues, suitable international partners, and financing challenges, including non-monetary hurdles such as land acquisition and social acceptance, also require policy attention.

Across India and other countries in the Global South, and the US, there is a pressing need to make clean energy careers more accessible to young people. To meet sustainability demands, an estimated 65 million green jobs will be required across various sectors, including energy, waste management, water resources, and agriculture. However, the current approach to skill development primarily focuses on modular training for specific tasks such as panel fixing and wire connecting. This piecemeal approach lacks the depth and breadth needed to address the multifaceted challenges of the transition. The American Climate Corps is an initiative that offers a low-friction, low-barrier entry point to correct this.

Shifts in approach to transition

Finally, three major shifts in approach are required. First, to move away from a highly centralized approach to energy supply towards a more decentralized and distributed model. Constraints in supply chains and grid interconnectors make this shift essential. Distributed energy should not be treated as an afterthought; scalability and resilience are features of distributed energy systems. However, this shift does not imply the complete disappearance of large centralized systems which continue to be integral to energy infrastructures.

The January 2024 announcement by Prime Minister Narendra Modi on rooftop solar installations for 10 million households is a significant example. This capacity, estimated at 30 GW, does not rely heavily on grid interconnectors and offers increased resilience by decentralizing power sources. It is also imperative to integrate distributed energy into a larger interconnected system rather than adhering to a rigid model of centralized generation, transmission, and consumption.

The second shift is to transition from a capital expenditure (CapEx) model to an operational expenditure (OpEx) one. Traditionally, energy systems are approached from a CapEx perspective, where costs continue to rise, even for clean energy alternatives like solar, wind, or nuclear. This often leads to a temptation to revert to fossil fuels due to their perceived cost advantages. However, an

OpEx perspective presents a different picture. For instance, the upfront cost of electric buses is significantly higher than that of diesel buses. Yet, innovative models such as reverse auctions based on the lifetime cost per kilometer traveled, display that the OpEx of electric transportation can be lower than that of diesel. This approach can be extended beyond buses to other sectors like green steel, where initial costs may be higher but the overall lifecycle costs, particularly in end-use applications like cars, can be competitive.

Finally, there is need for a shift in perspective so that resources put into climate and energy are considered not as cost but as investment against future risks. While these investments may seem like an expense in the initial phases, there is need to measure their value against the losses they prevent in the future. By leveraging complementary skill sets, India and the US can scale clean technologies more quickly, address each other's gaps, and enable environments that will accelerate energy transition. This collaboration will help fulfill the promises of a sustainable future.



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Global Health Security: Lessons From The Pandemic

Pandemics are now a more frequent occurrence than previously believed. Within the past 24 years, the world has grappled with two pandemics, H1N1 and COVID-19. These have been accompanied by several other outbreaks, including SARS, Zika, MERS, and the NEPA virus. This section of the report will focus on lessons drawn from the COVID-19 pandemic and its global impact.



Instead of fostering a global cooperative structure, the response leaned towards national self-reliance, which ultimately proved ineffective. Several governments responded by sealing their exports of essential medicines—APIs, gloves, and syringes—leading to the disintegration of supply chains. Medical equipment and vaccines became strategic substances. Actions like invocation of the Defense Production Act by the Trump Administration led to further complications. India found itself in a position where it had to diplomatically persuade these countries to override their export restrictions.

The severity of the disruption became evident when even basic substances like paracetamol faced shortages worldwide. The European Union, for instance, depleted its stock of paracetamol, prompting India to airlift emergency supplies to meet their demand. This situation was particularly striking considering the advanced pharmaceutical capabilities of countries like Switzerland, France, Germany, Britain, and Denmark. The inability to produce even paracetamol locally underscored the extent of the crisis.

While these countries could potentially retool their production lines over time, no single country possesses the capability to replicate the entire global supply chain domestically. The regulatory hurdles and time constraints make it infeasible to address such shortages promptly.

As a result of the pandemic, medical data is now being considered useful not only for economic factors and health care issues but also for security purposes. There is a realization that this information can be weaponized. Quad's working group on Critical and Emerging Technology (CET) is a testament to that as it tracks emerging technologies in areas such as synthetic biology, genome sequencing and biomanufacturing, and identifies opportunities for collaboration. The crisis also shaped future bilateral and multilateral engagements at several levels. The American experience with the Chinese response to COVID has overlaid their larger geopolitical relationship. The Quad working group on Health Security is another example.

Strategies for Future Preparedness

As far as learning is concerned, the effective understanding of pandemics involves three factors. First, pandemic prevention through international health regulations and disease surveillance both in humans and animals (including livestock and wildlife). Second, pandemic preparedness through resilient supply chains, research and development

for drugs and vaccines, and pools of at-risk financing to support national, state, and local stakeholders. Third, effective pandemic response through the adoption of a whole-of-society approach and robust outbreak management strategies.

During the COVID-19 pandemic in India, alignment between policymakers, administrators, the private sector, and scientists facilitated greater understanding of the disease itself as well as the faster delivery of vaccines. The swift conversion of health facilities into COVID care centers and an effective containment strategy contributed significantly to disease management. The government's initiative to appoint secretary-level officers with medical expertise as health secretaries also proved to be beneficial.

Effective surveillance plays a critical role in preventing pandemics. However, two significant challenges hinder this effort—the lack of data sharing and the absence of a predefined strategy to rapidly respond to this data. The strategy continues to be missing in the post-pandemic stage. While developed or developing countries may have the ability to navigate disease-surveillance structures, lower-income countries are yet to manage the same. The expansion of these structures on a global level and information sharing are crucial for prevention.

This was demonstrated by American units like the Centers for Disease Control and Prevention (CDC) acted as multilateral structures with their own data sharing practices and fostered international collaboration in research and laboratory maintenance. However, this arrangement is now facing Congressional scrutiny, leading to further complications and hesitancy among institutions, including the WHO, to engage in politically sensitive environments. While geopolitical issues often impede data sharing and surveillance efforts, it is essential to prioritize health considerations over political concerns. Additionally, the surveillance data should be able to identify new viruses and mutations.

It is imperative to continue collection of information and data as well as to standardize medical protocols for future pandemic preparedness. Trade associations such as CII, FICCI, and Assocham can play a significant role in this regard. Hospitals should prioritize infection-control measures should be integral to the design and infrastructure of hospitals to minimize and eliminate the spread of infections. Similarly, existing COVID infrastructure

can be used for drug-resistant respiratory diseases such as TB. These proactive steps will help enhance preparedness and response capabilities for future pandemics.

As several companies have now set up sustainability departments, there is also a possibility of setting up departments for pandemic management. This includes introducing risk mitigation practices and setting aside a budget for disease management.

Pandemic resilience should also account for collateral damage and the neglect of other health services. Long COVID presents a unique opportunity for post-pandemic multilateral cooperation. This involves gathering data from all sources to develop strategies for symptom identification, treatment, and management. Unfortunately, funding for COVID research has decreased, leading to a reduction in support for post-COVID clinics. It is crucial to ensure continued support for research and clinics dedicated to its management.

The India-US bilateral relationship should help rebuild trust in this domain. This exercise should be expanded to institutions like the Quad, G7, and BRICS. India has unique diplomatic leverage in this regard. By offering its robust digital health infrastructure as a global public good, India can also contribute significantly to international efforts aimed at pandemic prevention and healthcare improvement.

By offering its robust digital health infrastructure as a global public good, India can also contribute significantly to international efforts aimed at pandemic prevention and healthcare improvement.



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This report is a collection of essays written by Ananta's Prerna Bountra, Deputy Director and Richa Kumaria, Programme Officer. They encapsulate the rich discussions at the 7th India US Forum where participants were tasked with identifying recommendations for Indian and American policymakers to take this bilateral relationship forward. These recommendations fall largely in two buckets: how to face common geopolitical challenges and how to leverage mutually beneficial technologies. The authors have contextualised the recommendations by including the current approaches adopted by India and the US towards each issue. Individual essays are available on www.anantacentre.in



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