



THE INDIA-US FORUM

6TH EDITION, 2023

Report 2

ECONOMICS | ENERGY | TECHNOLOGY

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S. Jaishankar, *Minister of External Affairs, Government of India*

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 6 editions, the Forum has emerged as a coveted space to exchange ideas and set the bilateral agenda for cooperation.

The 6th edition, held on 13 and 14 January 2023 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.

The discussions from this edition of the Forum are encapsulated in two reports. The first report is on geopolitics, strategy and security and the second is on economics, energy and technology.

Resilient Supply Chains

Domestic Demand Propels Sustainable Shift of Supply Chains

- It is a sustainable and rational choice to manufacture in India. This is driven by two factors. The first is geopolitics and its related components. The second is how India is systematically using their huge domestic demand to create a sustainable shift of supply chains to the country.
- For example, Indian railways is one of the largest railway networks in the world. The challenge is to shift the large technology players to create a supply chain for railways. A method used is to create large contracts in which this huge demand would be a key pivot for any global manufacturer for shifting their entire supply chain. The way these contracts are structured ensures significant risk reduction for technology partners. These include the risks of construction, suppliers, price variation, and exchange fluctuation.
 - ~ There is a USD 3 billion – 35-year contract in place for supply and maintenance of the locomotive industry, and at least five such contracts are in the pipeline. The locomotive has close to 3000 components. With each of these components, it is natural for the supply chain to shift to India.
- Another example is photovoltaic (PV) cells for solar power generation. India's domestic demand is about 35GW. Domestic demand will increase from Production Linked Incentive (PLI) mechanisms. This will create another sustainable way of shifting the rest of the supply chain – chemicals, specialised gases, and other equipment. This is a sustained way of using domestic demand as a lever for shifting the supply chain to the country.

Role of Capital Expenditure (CapEx)

- When the pandemic hit, the first response was helicopter money. Capital will always be limited in any household, company, and economy. There will never be unlimited

resources. The trajectories of economies get defined by the choices made about capital.

- India's budget of 2021 was focused on consumption requirements coupled with a clear thrust towards CapEx of INR 5 trillion. The budget of 2022 followed the same path where CapEx was INR 7.5 trillion.
- When this kind of money is invested in highways, seaports, airports, power transmission lines, and the water supply pipelines, each sector witnesses huge productivity improvement – the multiplier effect.
- The way India's economy is structured, close to 60% goes to small and medium enterprises. The employment which correspondingly comes as a direct consequence of all these elements combined, starts building up the domestic demand.
- This strategy (increasing CapEx) took off in 2021 but it requires at least a year for it to play out in multiple sectors. Today, most factories are running at 70-80% capacity utilisation. The cycle started with construction materials like cement, steel, and paint. Then it moved to construction equipment and materials before flowing into electricity demand – power demand has gone up by 14%. Eventually, the disposable income of middle-class families started increasing, which further impacted automobile sales and the housing market.
- This creates a sustainable domestic demand which creates a pull factor for supply chains. Once there is a big enough pull factor, it can be coupled with clear policies leading to simplification of production.
 - ~ Since 2021, 1,500 obsolete acts have been repealed.
 - ~ Getting a telecom tower permit used to take months but now it only takes about seven days – this is the weighted average; in case it is near an airport or defence establishment.
 - ~ Timelines for Foreign Direct Investment (FDI) in the telecom sector have significantly improved.



Antony Blinken, *US Secretary of State*

~ Close to 99% of the mobile phones used in India are manufactured in India. India imported 78% of its mobile phones after Nokia collapsed in 2015. Now, it imports 1.2% of the volume, 5% of the value, and hit a USD 9 billion export. This shift from imports to substitution to exports is historic.

good investments in railways and waterways, the cost of logistics and electricity generation will automatically reduce.

- Investment in skills is an important soft factor. Without that, India cannot have a sustained growth path in the manufacturing sector.
- A big question is how to bring the component supply chain to India. Attempting to transition from import substitution to an export led economy causes policy to change, the earlier quoted example of mobile phones is valid here. The supply chain shifts to the exporting geography automatically.

Focus of the Indian Government

- Having transparent and clearly laid out policies on customs, duties and taxes.
- Logistics
 - ~ For the first time a clear policy for a comprehensive and integrated development of logistics was put in place through the PM Gati Shakti-National Master Plan. As part of this framework, India has been able to identify projects worth about USD 10 billion which will ease the logistics pain points. For example, better coal transportation will make electricity generation and steel making cheaper.
 - ~ The National Logistics Policy (NPL) has also been announced. It will utilise data and solve information asymmetry significantly reducing logistics cost.
 - ~ Any economy which is fully served by railways will have a logistics cost of about 6-8% while an economy which is fully served by highways alone will have a logistics cost of about 18%. An economy with an equal split would have a logistics cost of about 10-11%. As a natural corollary, the cost of logistics directly relates to the cost of electricity generated. Once India has

Digitalisation and Operating Standards

The logistics policy along with digitisation has made India the only country in the world where more than 80% of the transactions come through an e-proof of delivery dispatch. This presents India with a unique opportunity to be a leader in the alternative global supply chain. To be integrated into the global supply chain, India will have to work on operating standards; not just digitisation standards but also physical standards.

Electronic Supply Chains

Although India is just one-tenth of Vietnam's exports in electronics, it has immense export potential. There is massive exposure because the scaling of recent changes will be hardware driven – Internet of Things (IoT) devices, 5G, stack etc. India can emerge as a leader in this area. Earlier,



Ashwini Vaishnaw, Minister of Railways, Communications and Electronics & Information Technology, Government of India

resilience meant having the ability to pivot in case there was a problem. Now, there is no choice as the world learnt in the last few years. India and the US need to find cooperative strategies for onshoring, nearshoring, and friend shoring. India has the scale and the skill.

Reimagined Supply Chains

There can be many accelerated changes where trust and mutual respect play a big role. Questions arise about tools of technology and lens of circularity. It should not just be about shifting geographies, it should also be about doing things differently. Many believed that the earlier version of globalisation was exclusionary. The newly imagined supply chains' delivery is in question. As democracies, India and the US might be better placed to deliver it. They have to match their policy changes. For example, the infrastructure investment in the US and the PM Gati Shakti plan in India need to be pieced together to be able to work in tandem. Since supply chains are about timing, the level of urgency will be crucial.

Sustainability and Resilience

- India has taken steps to make sure that their supply

chains are sustainable even though their per capita consumption of carbon emitting energy sources is one-fifth of the global average. They need to think beyond the cost and balance or profit and loss perspective to have a more strategic view of things in the supply chain profession. That strategic view will try to make sure that if there is a risk which is coming because of any unknown natural or human made event, the risk has to be reduced.

- There have to be less stringent ways of defining ownership of technology and intellectual property to achieve a level of openness to sharing between the countries.

Anti-fragile Ecosystem

Antifragility is the core of the strategy. India should not attract the supply chain merely because there was a pandemic or other such factors. There should be a scenario where despite an absolutely normal year, people should make the economically rational choice of shifting their supply chain to India. There are multiple dimensions to it – policy, growing demand, making sure that archaic laws are removed – all things go into building an anti-fragile supply chain ecosystem.

Digital Security and Cooperation

Coming Together, Staying Together

- India and the US are working together closely – US India Business Summit (UIBS), International Counter Ransomware Initiative (CRI), the Automatic Intelligence Ingestion System where threat intelligence is directly received, and so on. In the cybersecurity bilateral they have a few working groups on cooperation in cybercrime, law enforcement agencies as well as capacity building. The previous cybersecurity bilateral dialogue, which is normally two days, was extended by a day to include the private sector representatives. Major companies from the US attended, there was a lot of discussion on artificial intelligence. There is even a defence cyber security dialogue.
- In all the bilateral, multilateral, and plurilateral dialogues they have, like Quad and I2U2, cyber plays an important part.
- Within Quad there is a Senior Cyber Group. There is another subgroup for critical and emerging technologies where three technologies have been identified: artificial intelligence, quantum, and biotech. All four countries are collaborating and mapping how to move forward.
- Between India and the US there is a lot to talk about in terms of 6G collaboration, cybercrime, Open Radio Access Network (ORAN) etc. With regard to the tech part, India and the US are getting closer.
- One thing that will make it easier for both the Indian government as well as US companies operating in India, would be India getting certified under the current US Clarifying Lawful Overseas Use of Data Act (CLOUD). Under this, US tech companies are obliged to provide data that they have stored in their servers. Certifying a foreign government under it would allow them to receive this data upon request.

Securing Digital Infrastructure

- Joint work is being done to secure digital infrastructure, within each country and with other partners around the world. Each nation is responsible for protecting their own critical systems from cyber threats and work together on common standards, to share threat information and best practices.
- They are not only concerned about the impact a potential attack could have on their people, but also the ability of

their adversaries to use intrusions into critical infrastructure as a leverage during geopolitical crises.

- Cities and communities around the world, including in the US and India, are incorporating more sensors, faster communication networks, and smarter artificial intelligence into the systems to make daily life productive, enjoyable, sustainable, and healthy. As they advance their cities through such technology, they must ensure that smart also means secure, that they set international standards that their indigenous industries can implement and spread around the world.
- To do this, they are working to incorporate security and interoperability from the ground up, develop innovative privacy enhancing techniques, and AI enabled cybersecurity.
- Smart City technologies promise to reduce air pollution, increase road safety, enhance food and water security, and improve equitable access to essential services. They also represent attractive targets for nefarious actors. They are working to upgrade security in the systems used today to ensure the security of complex multilayered systems of tomorrow. Similarly, they are focused on ensuring 5G and eventually 6G deployments are secure. Secure networks present a security threat to individual nations, but also undermine international cooperation on privacy, security and human rights.
- Over the last few years, there has been an acceleration of ORAN architecture-based deployments around the world. The service proof points to the robustness and viability of this approach. As ORAN serves the security and economic interests of both countries, it is a priority for both.
- Building in security by design is critical. India - US are now expanding their focus to make progress on some of the most ubiquitous connected items such as the Internet of Things. There is also a responsibility to work together across governments to avoid fragmenting the global marketplace by placing distinct and overlapping requirements on industry. They do not want industry to go through multiple redundant certification programmes and simultaneously, avoid placing burdens on consumers who will have to differentiate between various schemes and security functions.

Digital Handshake

Indian talent has powered top Silicon Valley. There is a fleet of iconic tech companies that are now headed by Indian origin CEOs. Firms like TCS, Wipro, Infosys etc. – 55% of



Gina Raimondo, *US Secretary of Commerce*

their IT exports are to North America. American enterprise is the number one consumer of technology through Indian services. American companies have also invested billions of dollars in bringing innovation products and services to millions of Indian citizens. There was a “strategic handshake”, as termed by former Defence Secretary Ash Carter, where defence cooperation was taken to new heights with tangible deliverables and outcomes. India and the US need a “digital handshake” at the senior-most leadership level. Economic trade and strategic partnership go hand in hand which is why cooperation can extend in the digital front in many areas.

Tech Enabled Democracies

- Questions like how technology will make sure people are secure, economically prosperous, and also ultimately sovereign need to be answered in a way that is relatable to the people.
- Neither the US nor India control the means of production over technology. A lot of the technology used around the world is produced by China. Both governments are pushing forward on various actions to be taken against China on technology. There will be a lot of US companies that would want to move out of the Chinese markets into markets around the region. Companies will have to be incentivised to move to India and South East Asia, places with like-minded values.
- Both the US and Korea have a Chips Act but instead of cooperating as a relay team and complementing one another, they run the risk of competing with each other. The priority should be to ensure that they compete with the Chinese market in the manner that is most effective. All this needs to be part of the dialogue bilaterally between India, the US and with other partners like the EU and Korea.

Talent Pipeline

There is a huge pipeline of Indian students into America and that is worth preserving. There are many issues around visas and immigration that the US needs to deal with domestically. It should be highlighted that this is a positive two-way exchange. There has been talk of a “million talent programme”. To bring in talent from around the world to work together in STEM, India is a key place. This two-way flow of talent should continue to build the ties between people in these fields.

Bridging the Trust Deficit

Bilaterally, one of the key things they need to agree on is trust. There is a country which is not the most trustworthy partner. At the same time, there are many democratic allies and partners that should be trusted. Fundamentally, trust can be a basis to the idea of supporting data flows that powers economies. Most of the capabilities, knowledge, R&D, and investment in technology come from the private sector. A new way to bring public and private together needs to be worked upon. Allies and partners - that is the core aspect of how democracies separate themselves from autocracies. As India and the US build a bilateral partnership, at some point they will think about how to extend what they do not just bilaterally but also globally.

Steering Both Economies Through Recession

Inflation

Both in India and the US, inflation is trending down. It would weaken the case for further monetary tightening. Whenever the US interest rates rise, there are concerns of dollar shortage. Countries which have a current account deficit always find that to be a challenging environment. At the same time there are interesting signs, which probably were not apparent a couple of months ago, that the US economy could actually be on course to achieving a softer landing than anticipated a couple of months earlier. China's unexpected Covid policies and their willingness to retract some of the other regulatory policies they were adopting with different sectors in the last few years. If these things presage a better global economic growth backdrop than what is currently forecasted, the Indian perspective will be filled with mixed feelings. This is because it would mean that oil demand would be firmer than anticipated and it would further raise the risks, apart from the lingering geopolitical uncertainties, the additional element of demand dimension to the oil situation which could be problematic.



Hardeep Singh Puri, Minister of Petroleum and Natural Gas & Housing and Urban Affairs, Government of India

So this is an important area from a global standpoint that India is watching.

Oil Prices

With regard to oil price predictions, the Reserve Bank of India (RBI) has taken in its baseline projections, a number that is between 100 and 105 per barrel on average for 2023-24, which seems realistic. If the global demand situation does slow down quite meaningfully and China's re-opening does not necessarily lead to a big spurt in their own economic growth, this number could turn out to be on the higher side. More than 110 will be a challenge for India to manage, in terms of its implications for external funding and current account. Tactically several investors might also find the relatively cheaper China market at least temporarily attractive, if not long term. If that combines with the higher oil price, then the combination might be something that is formidable.

Underappreciation of the Demographic Divergence

- **Gains to trade from demographic dividend:** The US and other advanced economies are aging; labour force participation is gradually falling. The pandemic brought

out very acutely what happens when there is a shortage of workers in the US. Part of the reason for the debate of the tight labour market is that two and a half million US workers left the US market in the pandemic. This is just a prelude to what is gonna happen over the next five or 10 years as populations age and labour force participation goes down. That is juxtaposed with India having its huge demographic dividend. If there is scarcity of labour in large parts of the world and a surplus of labour in countries like India, the gains to trade are humongous.

- **Services Trade:** It is estimated by McKinsey that over the next 10 years, India will make up 20% of the global workforce and 30% of the global skilled workforce. So for the US and India, this is a massive possible win-win. Services' revenues in India have gone from USD 80 billion a year three years ago to USD 120 billion a year this year. There's massive potential for services trade between these economies where labour intensive services are exported from India to the US.
- **Impact of de-globalisation :** The US tightened its immigration policy in 2016, there are about 3.2 million fewer immigrants in the US which almost exactly matches the two and a half million people shortage in the US labour market. The counterfactual - if immigration policy had



Jamshyd Godrej, *Founding Trustee, Ananta Centre & Chairman, Godrej and Boyce Manufacturing Co. Ltd*

not been tightened and had these immigrants been there, the US would not have such a tight labour market and wage growth would not have been at 6%. It throws into acute focus what de-globalisation does and, therefore, why it is so incumbent on India and the US to exploit this win-win over the next decade. The focus has been so much in technology but there is huge potential in trade of goods as well. The US wants a geographical hedge from China. India needs to integrate into global supply chains to create blue collar jobs. There is a lot of potential but there are many irritants like harmonisation of standards and FDI.

Healthcare Economy

- **Population patterns:** There are 1.5 billion people in the world over the age of 65. In the US, there are 54 million people aged over 65 on whom USD 22,000 per annum is spent on healthcare. The Japanese population will come down from 127 million to 100 million in the next 20 years. The global population is 8 billion. It will reach 10 billion by 2070. Eight countries will add to that, seven are in Africa and one is India. In Africa, the average age is 70. In India it is 27. In China and the US it is around 38. In Europe it is above 40. This is fundamental and irreversible.
- India keeps the US healthy
 - ~ The US was suffering from a healthcare crisis in the 1980s. That is when the Waxman Act came out to make healthcare affordable. American companies went to Mexico and Europe but they could not make healthcare as affordable. They entered Indian generic pharma companies in the early 2000s. Thanks to India's chemistry and process engineering, they were able to reduce the pharma cost significantly.
 - ~ The US spends about USD 500 billion on medicines – roughly 90% of which is on branded products and roughly 10-15% is on generic but in volume terms 90% generic and 10% branded. Roughly, USD 420 billion is spent on branded medicine which is about 10% of volume and roughly USD 80 billion is spent on generic pharma constituting 90% of volume.
 - ~ India made pharmaceuticals constitute 45% of medicines consumed by Americans in volume and yet charge them less than 10% of their medical bill. India has the largest number of USFDA plants. India is one of the top countries in filling complex generics Abbreviated New Drug Applications (ANDA), it has the largest share in ANDAs as well as the fastest ratio of approvals. This is India's contribution in keeping the US healthy. There are about a million doctors of Indian origin representing 30% of the workforce.
 - TCS is a USD 27 billion business – data, distant

consultation, distant imaging, pathology etc. There are quite a few USD 25 billion companies which can be created by shifting from IT services to nursing and care.

- If India becomes the care centre of the world, their healthcare services would take off. In Amazon, 40% of Amazon Web Services are of Indian origin. Untrained people have been sent to the Middle East who have been treated badly. That can be changed if Indians start displacing the Philippines in the care area.

Engineering

The question arises – can what happened in IT and generic pharma be replicated in other industries in the context of US-India partnership? Two industries which come to mind clearly are engineering and engineering services. China exports about USD 600 billion of engineering goods, two-thirds of that to Western Europe. India's total engineering exports is about USD 30 billion. India and the US can collaborate on this. In engineering services there has been some traction but it needs a push. The US and India need to work together to ensure that Indian talent gets visas at the right time. Indians take about two years to get it while the Chinese get it in two days. Certainly, things need to change. If India and the US collaborate, just as Indians keep American citizens healthy, they can keep the American economy healthy.

Infrastructure

- India and the US are embarking on a similar approach but for slightly different reasons. In the US, for many years the infrastructure was considered to be one of the worst in the Organisation for Economic Co-operation (OECD) countries. At the same time, there was stagnant growth in the economy. There was a school of thought that the way the economy is kickstarted and put it into a different level of growth can reconstruct the infrastructure. In a way this is what the Inflation Reduction Act is doing, it is putting about USD 400 billion into building a green economy through incentives and investment, by incentivising the private sector to take the lead.
- Historically, most of the infrastructure in the US has been muni-financed because municipalities have a lot of access to the bond markets. However, it is not operated as well as projects in other parts of the world. The financing of that is coming from increased taxes. India has also embarked on a large infrastructure build out – namely, the National Infrastructure Pipeline. Investment required for it is USD 1.4 trillion. A listing of all major infrastructure projects around the country by both the central and

state governments has been produced. India has to build its infrastructure to scale up manufacturing.

- Interestingly, India has not chosen to finance this with increased taxes but by finding money from different places including monetisation. There is potential for inflation because of such investment and the world is already facing an inflationary situation due to fossil fuels and fertiliser prices. Economic stability would improve if fossil fuels are substituted with other sources of energy.
- There are many ways India and the US can work together on this journey where infrastructure build out will be supported by domestic manufacturing capacity in new age sectors like solar battery. This collaboration is crucial because if each country starts building its own manufacturing capacity in these kinds of areas there is going to be a lot of wasted capital.

Protectionism and De-globalisation

- For strategic sectors and goods, redundancies and supply chains running through “friendly” countries are desired. But this is a slippery slope - it should not become a prelude to protectionism and de-globalisation.
- The worry is that from the US-China trade war in 2018 to the pandemic, there seems to be a license for all countries



Jennifer Granholm, *US Secretary of Energy*

to become more protectionist. This is a zero-sum game. The reason such prosperity has been achieved in the last fifty years is because the global supply curve moved out – higher growth, higher productivity, lower inflation and high cost of living. Geopolitics is going to change that model which needs to be calibrated. If this is a swing back to a situation where every country produces every good, then it is a lose-lose for everyone – it guarantees a decade or two of low growth, low productivity, low innovation and high inflation.



N. Chandrasekaran, *Chairman, Tata Group*

- No emerging market in the last 100 years has grown at seven or 8% for a length of time without export growth. India needs a relatively globalised world to get that export which will not just benefit India but will be a win-win for advanced economies whose populations are slowing and will eventually contract. Just as China has moved the goods supply curve out, India has the potential to move the services supply curve out.
- Friend-shoring should not become a euphemism for de-globalisation. A cautionary tale, given the preeminent position of the US and India's position in the G20 this year, there are two risks. First is the slowing growth and second is ill anticipation of financial accidents after decades of liquidity. This is where the US and the G20 need to come together.
- A concern is that it is too difficult for countries to get liquidity. The IMF has this liquidity facility but only eight countries qualified and three received it – too little, too late. The Common Framework for Debt Treatment of the G20 needs to get its act together – 41 low-income countries are on the verge of debt crisis and if inflation goes down and inflation rates go up it will affect those countries the most.

Debt

- Emphasis on coordinated action, whether it is with respect to monetary or fiscal policy, is unfortunately theoretically elegant and politically correct but devilishly hard to implement in practice. Ultimately, countries just as they do foreign policy for their national interests, they do monetary policy for their national economic interests. All that can be done is a certain mitigating mechanism like swap facilities which are slow to come by. Those are the things that need to be worked upon. Another way of mitigating the fallout of individual/country monetary or fiscal policy decisions is current countries that are vulnerable to the risk of prolonged high real interest rates are pre-emptive actions that prevent countries from becoming more indebted.
- International organisations like the IMF cannot do naming and shaming in public but if there is disclosure, subject to all these considerations of sensitivity about what are the safe thresholds, countries continue to borrow due to political reasons because it leads to short-term economic gains, and later face the consequence of indiscriminate lending and borrowing.

Import Duties

- The case for lower import duties, particularly on primary

commodities and intermediate goods, is well known. India benefited from the globalisation of the last four decades. China benefited from manufacturing offshoring, whereas India benefited from services offshoring. However, from a philosophical perspective, it is understandable that there will be certain natural reactions to the ill-effects of globalisation.

- Durable answers are required for problems like income inequality within countries which is difficult for the political leadership to execute. Therefore, they go for the lowest common denominator of trying to do friend-shoring or reshoring etc, which is easier to implement. That is now becoming the norm across the world, not just in India.
- India's policy of trying to create a certain safe harbour for some of the industries to gain scale and become globally prominent is not necessarily a bad thing to do. The question should not be of the policies of giving some safe harbour for the industries to grow but what is the demand in return for that safe harbour?
- If temporary protection is in return for performance and productivity, then it is understandable. But it cannot become an entitlement or an excuse for inefficiency. Those are the considerations that are valid. But to say that this policy is completely unacceptable is to argue against the empirical evidence of the last 250 years because some of today's free traders were not free traders, when they were building up their industrial capacity.

Central Banks and Risk Mitigation in Green Financing

- For green financing there are lots of classical positive externalities. The private sector will always under produce this which is why coordinated action is required from the public sector, whether it is fiscal or monetary authorities or international financial organisations, to internalise the externality and provide incentives for that money to come.
- It is equally clear that post pandemic there was a doubt that fiscal positions are so stretched in emerging markets, that this will have to be financed largely by the private sector because there just is not fiscal space or public sector space to do it. The outline of the Federal Reserve's chairman's position is that the lesson that central banks have perhaps learned from the last 18 months is the old Tinbergen principle, where there will only be as many objectives as there are instruments.
- In advanced economies, central banks took on so many

different objectives that they didn't have enough instruments to service objectives and in doing so, they failed on their most fundamental objective which was inflation management. The point conveyed by the Fed is that they do not have more instruments to service all these goals, to have full employment and keep inflation under control, and service the green economy and help with inequality.

- People are not putting their money where their mouth is. For the domestic public sector, fiscal policy has no space and monetary policies have no instruments. The key in green sectors is to scale because if that does not happen prices will not be brought down to competitive levels.
- From a central banker standpoint, it is short term inflationary, so they will look at it and say in the short term there is not really much gain. For example, in the EV sector in India, one of the issues is that customers cannot get financing. The bankers have sensible reasons for not giving finance. In the solar industry, India is struggling because of imported modules which depend on currency fluctuations and module prices in another country. When the US comes into the market module prices go up, when the US slows down, module prices go down. India is financing all this with foreign capital. At some point that is going to also have an impact. The trillion dollars of local domestic savings that India has, needs to open it up for green from an investment standpoint.

Geopolitics

It will have three components: areas of cooperation, areas of accentuated competition and protection and areas of undiluted conflict. There will be areas of cooperation on space, health, and hopefully the environment. There will be protectionism for the next 10-20 years in some form but it will be manageable because of high interlinkages in the world to be able to unwind them. In technology, the absence of basic standards of private goods versus public goods. The underlying structure is that if there is going to be autarky, it will be in respect to technology and blocks will emerge. There will be a US-centric block of which India will be a part of and there will be a China-centric block. De-globalisation is not possible given the level of integration. There will not be a Soviet Union vs. US situation.

From India's standpoint

From a policy planning perspective, India has to assume that the world will be relatively less friendly to the expansion of global trade and goods & services. Therefore, it has to be a case of gaining market share rather than benefiting from a growing global trade pie. If it happens that is great but for planning purposes it should be assumed that will not be the

case. Therefore, India has to constantly nibble away at areas of un-competitiveness – whether it is in regulations or cost of doing business. That should be the focus. In the last decade, India was rebuilding balancing sheets in the financial and corporate sectors which is largely done. Therefore, all public policy should be focussed on letting the improved balance sheets of the financial and corporate sectors drive growth forward rather than assuming responsibility for growth.

Beyond Visual Range: Evolving Rings of Emerging Technologies

ML Explosion in India

India is one of the biggest free internet markets in the world with over 850 million internet users – out of which around 1.2 billion are mobile users and around 400 million transact every month making payments. There are close to 8 billion payment transactions every month. India can be the ‘Data Capital’ of the world. This richness of data presents a unique opportunity in training machine learning algorithms in a trusted and transparent environment. A machine learning (ML) explosion is expected in India with the new approach towards technology and development as evidenced by digital public goods – Aadhaar, Electronic Know Your Customer (eKYC), Unified Payment Interface (UPI), Covid Vaccine Intelligence Network (CoWIN), along with the digital commerce stack ‘Open Network for Digital Commerce’ (ONDC). India has always partnered with the US to take care of the top-down problem. Emphasis should be on collaborating more by conducting research, engaging in exchanges, and building greater trust online.

Export Control Regimes

The US put India under one of the most stringent technology denial regimes. The 1998 embargo on India prevented sale of space components. But through soft diplomacy waivers emerged – in 2018, the Indian Space Research Organisation (ISRO) launched 96 American satellites on a single Polar Satellite Launch Vehicle (PSLV). Export Control regimes need to be eased for better India-US collaboration.

Semiconductors

In the last two decades, there has been a sudden recognition of application and ownership of semiconductors in the supply chain. Most countries looked towards Taiwan as the one place for semiconductors. But what Taiwan uses as inputs to build the chipset, comes from various countries. Fab companies had a shortage of argon gas, which is required to build semiconductors, because of the Ukraine war. In today’s multilateral world, there will always be

interdependency. Therefore, the idea does not have to be to seek complete control over the supply chain but having a significant contribution in it. India is one of the biggest contributors in the design of the chipset.

Startup ecosystems

The startup ecosystems of India and the US actively collaborate with one another. Core computing encompasses everything from chips to data to sensors to the Internet of Things. This decade will be big for quantum computing, it will have a profound impact. It is important to have cybersecurity research concerning Artificial Intelligence (AI) to mitigate the negative effects of its usage. This research represents yet another enormous chance for India-US to work together to identify ethical applications of AI to protect their systems from improper use.

IT Services

The IT service industries of both India and the US have collaborated on discovery and framing policies since the early 1990’s. Both countries have adapted to the realities of the external world and changing capabilities and needs of each other. The US has benefited greatly from the large amount of work that is performed in India for the various user industries including banks, telecom companies, manufacturing companies, and retail companies. India is a reliable partner, a transparent player in terms of using technology, and a great place for testing out and building use cases to scale.

Funding Emerging Tech

- There are companies in India doing cutting edge things like producing the finest single-walled carbon nanotubes in the world and working on green propulsion. India-US cooperation should not be limited to legacy companies and government to government collaboration like the synthetic aperture radar satellite – Nisar. It should include new space companies as they are not bound by the same constraints that legacy companies are, their business models are fairly organic, and they adapt quickly. India needs to look towards the US in terms of funding regimes. NASA has something called a Small Business Innovation Research programme which gives out up to USD 125,000 to prove technology feasibility and up to half a million to commercialise the technology.
- India is now focusing on getting technology out of research institutions into the next stage of translational research. Several national missions have been established for this purpose in areas like cyber physical systems and quantum. The India-US funding mechanisms should pay attention to these missions.



L-R: **Vinay Kwatra**, Foreign Secretary, Government of India; Forum Co-Chair and **Indrani Bagchi**, CEO, Ananta Centre

Trustpolitik

Leveraging NSF to Build Trust and Transparency

- The National Science Foundation (NSF) is a USD 8.8 billion agency. These fund all aspects of science, technology, engineering efforts all across the US. It is building unique bilateral partnerships. The four P's – partnerships make possible possibilities, possibilities allow significant progress, through progress comes prosperity for nations. This is the pathway to build trust and transparency. Conversations are necessary but not sufficient. It needs to be built on the core threat of how building science and technology frontiers in the future is perceived.
- For example, Covid vaccines were developed in an amazingly short time span and yet the adoption of the vaccines were not at the level that people expected it to be. This was a fundamental problem because of trust. When disasters like this happen, NSF jumps in and starts rapid investments and rapid projects. Nobel Laureate Abhijit Banerjee, in one of the projects, highlighted that the trusted messenger mattered. So technology development in itself is not the solution. Social behaviour, economics, humanities etc. interwoven with technological development is vital.

Data Governance for Trust Building

- The problem with technology is that first technology is built and then solutions are fostered. One of the ways to build trust is related to data governance. If data is going to be the bedrock of all technology, unless one trusts the manner in which data is governed, all geopolitical relationships will not be able to progress.
- The first digital public infrastructure was the internet and email which were built on open interoperable protocols. But somewhere along the way the vision for that open interoperable protocol was lost. It is important to focus on that and try to rectify that as a way to improve trust in our global relations.
- Indiastack is not just a payment, identity or health solution, it is also a data governance solution. It is a regulatory infrastructure in which open interoperable protocols have been prescribed for core sectors like finance and health. Those opening interoperable protocols are controlled by the regulator but they are proliferated by the private sector.
- Governments are terrible at innovation, they should never be allowed to dip their hands in innovation. But innovators, if they're allowed to innovate, can run amok. So there has to be a strong way to control innovators



L–R: **Paul Dyck**, Vice President, International Government Affairs, Walmart; **Saon Ray**, Visiting Professor, ICRIER; **R. Dinesh**, President Designate, CII & Vice Chairman, TVS Supply Chain Solutions; **Ashwini Vaishnaw**, Minister of Railways, Communications and Electronics & Information Technology, Government of India; **Virat Bhatia**, MD, Apple India; **Bhairavi Jani**, Executive Director, SCA Group and Chairperson & Founder, IEF Entrepreneurship Foundation; **Josh Foulger**, Managing Director, Bharat FIH Ltd

to ensure that they remain competitive and consumer protection is taken care of.

- It is difficult to regulate technology companies and that is what has happened for the last 20 years. India's solution, which is to create a regulatory technology infrastructure, where on the same infrastructure the regulator can regulate and the innovator can innovate, is perhaps an interesting solution to this data governance problem.
- India has already connected the payment system with Singapore. There is great potential of doing that with FedNow in the US. It is also a data sharing system which is the last layer of Indiastack.
- Operationalising free flow of data is another concern. In the software track the Parallel Fast Fourier Transformations (PFFT) is a framework. All of that is a theoretical regulatory framework. If countries can build open interoperable stacks for their own data systems, it is relatively trivial to connect the stacks to each other. If these stacks can be connected to each other, then a strong technology framework through which PFFT can also be implemented. It can be decided in which manner the relationship develops bilaterally.

Data Governance and China

- The issues of data governance and data trade should be recognised as central to US-India shared interests and shared security concerns.
- Xi Jinping has been consistently vocal on the strategic importance of data to him and the Chinese Communist Party. India deserves the admiration of the democratic world for having decided in 2020, after China's assault in the Himalayas, to ban TikTok and scores of other Chinese apps as an asymmetric response to keep these Chinese platforms out of the enormous Indian domestic digital market.
- India appears to have another opportunity for global leadership to serve as a model with its draft law on data. The law was recently amended to move away from its initial harsh posture of national data localisation, and towards promoting cross border data trade with so called trusted jurisdictions.
- The trust approach could be a watershed for alignment not just with the United States, but with others around the world, like Japan which pioneered this concept of the data free flow with trust to find a way to expand data trade with friends, while limiting it with rivals.

- This data free flow of trust concept seems to deserve more attention than it has received from strategic circles. On the centrality of data to global future competition, Xi Jinping has made clear. In a speech in 2013, he told the Chinese Academy of Sciences that the vast ocean of data, just like oil resources during industrialisation, contains immense productive power and opportunities.
- Whoever controls big data technologies will control the resources for development. Xi and the Chinese Communist Party have indeed made a strategic priority of exploiting data both inside China and around the world.
- Data on everyone's personal and economic lives, personal health records, genetic sequences, online browsing habits, corporate trade secrets, supply chain records, financial accounts, photos, voice recordings, mapping imagery, everything in phones, drones, increasingly even cars is harvested by Beijing. This is used for espionage for the development of artificial intelligence, other foundational technologies for global commercial advantage and for PLA military modernisation.
- Data control is also critical for Beijing's global influence and censorship strategies. It is why Beijing's regulation of Chinese apps is so aggressive. Through apps like TikTok Beijing can harvest mass data of the Americans and others and transmit favourite messages in unprecedented ways.
- In the US, there are effectively no rules governing any of it. The US is working towards expanding their digital trade arrangements overseas. There is also an urgent domestic task to curb the massive unregulated flows of sensitive data to China.
- Data sets have enormous commercial, strategic, and national security significance. TikTok, which is under the influence of the CCP, is the fastest growing news and video content outlet in the US. TikTok's parent company ByteDance's Editor-in-Chief is also the CCP's secretary of ByteDance who is responsible for ensuring the company's alignment with party interests. In 2018, he declared that the company should lead across all product lines and business lines to ensure that algorithms are informed by the correct political direction and balance. In 2019, ByteDance signed an agreement with China's Ministry of Public Security, which is akin to internal police, pledging to boost network influence, online discourse power, enhance public security propaganda, guidance, influence, and credibility.
- Now Washington is serious about data privacy, counter-intelligence, election, integrity, and democratic sovereignty. No hostile power is entitled to control a leading US media platform. To keep hostile powers from wielding that kind of influence is a safeguard of free speech.
- It is compelling that Washington should find an appropriate vehicle to ban Tiktok, given these national security concerns, was once a marginal idea but now gaining increasing bipartisan support, especially in the Congress. Tiktok is not the only problem of this kind. It includes bio data, drones, data centres, autonomous cars, critical infrastructure, and much more. The US has a fundamental posture of openness of unregulated data flows. While it has fuelled many advantages of the internet, it has also proven over time, immensely threatening to our national security. While it has fuelled many advantages of the internet, it has also proven to be immensely threatening to our national security over time.

Indian Data Law and AI

- The latest iteration of the new personal data law is a site where deeper engagement between India and the US can be fostered. In the last few years, there has been tensions between India and the US on the issue of data governance framework.
- That relationship has been fractured, not just on the questions of cross border data flows but also intrinsically tied-in questions of law enforcement access. This is one of the motivations of the Indian government for wanting local storage of data in the first place along with preventing foreign surveillance. Some of the complex solutions that have come up to data localisation have not been well received across all quarters of the government.
- For instance, the idea that India should look at the cloud as a possible solution for law enforcement access and consider an executive agreement on the cloud app, periodic review every five years, and on the idea of reciprocity. It is noteworthy that the prevention of foreign surveillance or access of Indian citizens data by foreign governments was one of the motivations for data localisation in the first place. It is not entirely a bad idea to start with a clean slate, and this new bill is an opportunity for that.
- Questions arise about contours of a data flows/ data sharing agreement between India and the US. Starting from scratch, not just from the perspective of cross border data flows or for the purposes of trade and commerce but also building these elements.
- Questions also arise about law enforcement agencies

in both countries having access to data without getting trapped by the contours of the cloud of data localisation policies.

- Another side for cooperation and deepening trust could be voluntary data sharing in the private sector. One of the things in the data governance debate in the past few years in India has been this idea of what the government calls non personal data and the industry calls business insight or anonymised data. Typically, large American tech companies; and other stakeholders, in particular Indian startups and to an extent the Indian government should have access to this data because many wonderful things can be done with it.
- India is rethinking the way they regulate different aspects of the internet through the Digital India Act legislation. Openness and transparency are its key pillars. One of the manifestations of openness and transparency will be opening up data that resides in silos, whether it is through allowing individuals to be able to port data across platforms or whether there will be larger models where it can be done at scale. There is a huge opportunity to think about what voluntary data sharing models look like.
- Intellectual property considerations are also important. There are different ways to think about rights underlying data. Critical and emerging technologies with regard to regulatory frameworks around artificial intelligence have potential. Guidelines on public procurement of AI and IP rights in data sets are some of the things India and the US can evolve by working together. There will be restoration of trust between citizens and the government, when the government is securing AI. They can work together to co-develop and co-create AI technical standards along with other protocols and frameworks.

Trust and Data

- Indians trust the US, Americans trust India. Almost one-third of the doctors in the US are of Indian origin, 40% of drugs in the US are actually Indian drugs, a lot of the data in the US is processed in India in terms of financial services etc, many Indians study in the US. In the context of the new bill, the term 'trusted geographies' is concerning because if the US is not on the list that would mean India does not trust them.
- Data governance in the US is the Wild West as their legislation is harm based. Through the Puttaswamy judgement, citizens of India have been granted a right to privacy. It is not just about harm, that is how one will be penalised but it entails that someone's data is their property.

- Europe and the US signed a data exchange agreement. An Austrian activist, Max Schrems, raised concerns in the European Court of Justice as he believed it was against the European Union's General Data Protection Regulation (GDPR) as the American law is woefully inadequate. His appeal was squashed. More attempts were made but it was not finalised. American companies set up data centres in Ireland where they have localised data.
- Today, India is the largest consumer of data in the world. There is no business case where a company like Facebook cannot localise its data in India. MasterCard, Visa, and American Express have done it. There is no reason to push the US government because two big jurisdictions of data consumption – the EU and India – are concerned about what will happen to their data but they are clearly more concerned about what the Chinese government will do with their data.
- The Indian law does not even allow Indian companies to misuse Indian user data, certainly not foreign companies to misuse it. So, if there is an expectation that the data is being sent to a geography. There is no trust deficit between the two countries and their people. One issue is that the US should come up with a law where privacy is given importance as done by the EU and India.

Tech solutions for Trust Deficit Problems

The trust deficit in dealing with the Registrar of Companies vanished once a system tech driven solution was found. An intermediary is required between the state and the citizen – some kind of neutral, impartial mechanism and the obvious thing that offers itself is technology. An example is getting passports issued in India. Earlier it used to take much longer than it does now because it has become automated. Another example is DigiYatra where citizens upload their biometrics which demonstrates faith in the government and makes life easier.

DPI

There has been a surprising shift in the Digital Public Infrastructure (DPI) conversation. Around the world, people look at DPI as a way for developed nations to come up. The US has come to realise that it is also a remarkably smart way to address the competition problem that it is currently grappling with. There is a public-private play as DPIs have been built with the help of the private sector, other than the initial Aadhaar. Open Network for Digital Commerce (ONDC), the latest in the stack, is almost entirely by the private sector.



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Balance Between Energy & Security

Clean Energy – A Pillar of the India US Partnership

- Clean energy transition is a pillar in the India-US cooperation. Metaphorically, what is an East-West issue should not be made a problematic West-South issue. The urgency of the energy crisis is present not just in these two countries but all over the world. It plays a major role in the broader economy; it impacts food and access to other resources.
- Will the urgent trump the important or will the urgent and the important come together? What are the kinds of choices to be made for the energy transition in light of the immediate crisis for energy security?
- The role of energy in macroeconomic challenges is not limited to the cost of fuels, imported or domestically produced. Another complication is around the potential to set up protectionist barriers. Countries can respond to the crisis by isolation or use the crisis to become interdependent. This surrounds the issue of supply chains. The role of industrial policy in the energy sector – new technologies, business models, financing etc. – will need

to go beyond the current crisis and draw both economies closer.

Energy security and clean energy – compatible or contradictory

- For politicians, the urgent challenge is also the important challenge. There is little differentiation. If actions are not taken urgently regarding the energy crisis in places like Europe, there will be political implications. The question arises whether urgent problems can be solved without affecting the long-term trajectory of climate change.
- Given the disruptions to global energy supplies, the fundamental question is whether it will lead to a path which is fundamentally misaligned with the path for climate action.
 - ~ This is potentially true in the short term as countries will struggle to find solutions that solve their immediate problems. Those solutions might be fossil fuel based.
 - ~ The other issue is that even if they want to ramp up capacity for clean energy faster as a way to solve the immediate problem, it is not that easy today. It can be argued that globally everyone is trying to go at the fastest pace possible for adding new renewable energy capacity. The pace cannot increase suddenly because



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of supply chain constraints. Grids are not ready to absorb such intermittent power, there are local permit issues etc. Short term solutions based around fossil fuels are needed. This is why coal prices have shot up.

- ~ One potential solution is to restart nuclear plants instead of wind and solar. For example, there are almost twenty plants in Japan which have been restarted. Any nuclear retirements that are about to happen in Europe have to be re-evaluated. Overall, in the long-term renewables have to be ramped up much faster.

Decarbonisation with deindustrialisation

Decarbonisation with deindustrialisation is a trajectory that only advanced economies can afford. In the past decade there was a big push for solar, wind and so on. India has already become the fourth largest renewables market in the world. This decade there might be a push towards industrial decarbonisation. The Indian cabinet also approved the green hydrogen mission which is the largest of its kind – 5 million tonnes of production by 2030.

New Industrial Energy Technology India-US Partnership

- The Indian government has committed to reach net zero by 2070. For companies there is little choice but to carbonise before 2050 because of the global supply chain.
- In many sectors that are India driven, like agriculture, there could be some element of play around the 2070 commitment. This is not just a question of energy but also of resource intensity and biodiversity.
- There is a tendency to ignore bio-resources and the role they play in our environment. The current crisis triggered by the unfortunate war has brought in front the nexus of energy, food, and water.
- India is trying to build a coal-based fertiliser plant. This is the direction it has taken because of the energy crisis. Whether or not it is right or wrong is a separate question because food on people's plates is a bigger issue.
- Natural gas has a big role to play in fuel switch but that is not the case in India because of supply side dynamics. India has a huge solar programme but the entire solar value chain is broken. Panels are being imported from

China and assembled in India. So instead of foreign exchange going to the Middle East, it is now going to China. Technologies exist in Europe and the US – India will have to work with them to build that value chain, starting with polysilicon then wafers then panels and so on. A structured value chain approach is required. Addressing the end point of energy transition without going back to root causes.

to get contracts which are long term for LNG. Only long-term contracts will give supply side and price stability. At the same time, it has to evolve mechanisms which can help take advantage of markets. So when the prices come down, it should be able to go in and lock imports while being able to take care of the long term needs. Although all efforts are being made by the government to really expand and move ahead in exploration and production of hydrocarbons, it is the geological aspects of the country which may come as a challenge for India. Therefore, India will require good relations with gas exporting countries to be able to keep a steady supply of natural gas. The US has expanded its LNG export capacity to help shield their allies in Europe as the fossil energy market has been weaponised against them.

Fusion Technology

- There is an opportunity to jointly develop and commercialise the next generation of nuclear energy systems. Nuclear energy is undisputedly the most robust source of clean continuous power, not incremental but continuous power. It achieves dramatic reductions in generational costs.
- With latest technologies, safety has increased and proliferation has minimised. High quality construction of advanced reactors and associated fuel facilities at potentially much lower costs in India is something that India can look at on the fusion side.
- General Atomics has pursued high helium cooled high temperature gas reactors and fast reactors. Public private partnership models could be explored. This reactor could actually have a 50% boost in plant operating efficiency. There is a big hydrogen mission, the byproducts that this can produce is hydrogen and portable water through desalination. These will serve well in India's clean energy policy.
- There has been a big breakthrough in fusion ignition. In the renewed focus of the US fusion programme and the resources that are being put towards that, there is another opportunity for the US and India to collaborate because India too has its robust fusion programme. There is potential of jointly developing an electric fusion reactor with India under a cooperative scientific, technical and manufacturing programme.
- The key is the conversion of the energy produced to electricity generation. For example, with coal it is approximately 38%, with natural gas it is approximately 55%, and currently, with nuclear it's about 33%. However, with these advanced nuclear technologies, it can reach 53%.

Clean energy vs. Oil/Gas

Clean energy and oil/gas investments are different because they address different parts of the energy value chain. One cannot be done at the exclusion of the other. Both have to be done rapidly. Oil prices need to be stabilised, not by investing in it and keeping excess supply but by working on the demand side. This can be done by developing used cases that are not dependent on fossil fuels as the only solution. Channelising investments into the supply of fossil fuels to keep the price down and competitive will make climate change much worse. Perhaps, investments should go into R&D and figuring out how to use green hydrogen in the shipping, steel, and cement industries etc.

Combination Solution

- There are many unexplored areas which need to start opening up. In terms of the energy architecture itself, the policy level needs to be more holistic. In the energy transition framework, the steps to be taken are known but in every issue there is some bottleneck which needs to be unlocked.
- The decarbonising framework should include adding forest resources to decarbonise the atmosphere. At the policy level there is not much incentive to do so. India finally has a biofuel policy. But it is only concerned with terrestrial biofuels. Perhaps, marine biofuels can be considered as India has a huge coastal base. Shrimp farming is in place. There is technology to use micro algae too. It may not solve the entire problem but it will play a part. The reason why nuclear has not moved in India is the civil liability issue.
- There is a technology discussion between the universities and R&D organisations of India and the US. It has to be pondered upon whether research on things like sodium chemistries which are being funded will solve problems

LNG

Liquified Natural Gas (LNG) is dominated by countries, like Japan, which not only have a consistent demand but also can command much higher prices. India will have to use all its prowess as a diplomatic and emerging economy leader

in the future. Combination research to address new alternate technologies is critical.

- The issue of green hydrogen will not be solved without solving electrolysis and low cost electricity. The private sector is not going to invest without a supportive framework.
- In many ways, India will put more carbon in the air as it grows. But after some point it will come down. And in order to address that, work has to be done together on multiple fronts. The US and India can play a pivotal role here in being pillars for addressing energy security.
- There are two bottom line topics that need to be addressed – one is the diversity of resources, second is the technologies required to unlock those resources. It has to be addressed as a national security imperative.

Way Forward

- In the next 30 years, India is going to face an energy demand which is equal to the size of the European Union's current energy demand. India has to be able to use the fact that it is a major player in the energy segment going forward.
- One possibility is to become a full member of the International Energy Agency (IEA) and start influencing the processes that take into account the requirements of the global south. Another possibility is to set up a separate agency which looks at the global south issues and perhaps get some more advanced countries like the US. Another possibility is to use existing forums like the Quad and create a much stronger energy component and dialogue within those entities. Sectoral cooperation is another possibility.
- India and the US are the second and the third largest users of energy for the foreseeable future. There has to be a much stronger dialogue and discussion between the two countries, especially given the amount of supply chain that China has concentrated into itself.
- It is not sensible for the world to have 90% of solar modules coming from China. Batteries, electrolysers, and other parts of the value chain are also moving in that direction. Countries need to come together and find ways of putting in place specific, tangible, and concrete, trade policies that essentially say that if one country produces the other will buy from it and vice versa.
- High level statements have to translate to policies. For example, India is considering investing in polysilicon,

the question arises whether the US will buy it or will it change its policy later and buy it from China because it might be cheaper.

- Clear cut long term policy direction in some areas are required if they want to develop long term supply chain solutions. It is noteworthy that 75% of India has not been constructed. It is a huge opportunity for reducing carbon.

Critical Minerals

- Critical minerals security requires resilience and foresight which the world has not yet shown, with the exception of China. Forums like the Quad have to figure out how to get access to these raw materials.
- The proven reserves are still a fairly small amount of the potential total reserves that exist. Therefore, exploration is required so that such capabilities can be set up in countries like India rather than having to go through China potentially giving it the opportunity to hold the rest of the world hostage on these mandates. All this requires risk capital to go into different geographies. The government will have to step in and support the private sector. There are roadblocks to the exploration and mining sector to protect bio resources.
- The circularity piece is critical as recycling batteries is a big business because there is an end of life after 10 years for batteries and it may be used for another five years from mobile solution to stay stationary solution. Continuously mining fresh resources is not the end of the solution. The whole mining sector is a huge problem in India, not because of regulation but because of enforcement. This will remain until an easy to implement regulation is created.

Alternatives

- The role of innovation and R&D to get into alternatives is important. On sodium chemistries, the best work is happening in France, the UK, Japan, India, and partly in the US. These teams are working in silos, they can potentially work together to foster solutions. A way has to be found to network these teams to get to a solution which is faster.
- Nuclear is cleaner but as a developing country, India will always be cost focused. NuScale is building its first Specialised Mobile Radio. The disconnect between the US markets and the rest of the world is large. The US is in a privileged position. Italy has banned nuclear power completely but only a few kilometres away from the border, in Croatia, there are nuclear power plants. This anti-nuclear

issue has to be made safe for the entire world. It is not a country level issue anymore.

- There are different types of battery solutions – flow batteries which are better for longer duration storage and shorter duration high frequency batteries. Not all of them require lithium or even sodium, some of those require other chemistries.
- India has pioneered cost minimised round the clock combination of wind and solar together with a small amount of storage which give capacity utilisation factors as high as 80-90%.
- There are people specifically looking at the issue of availability of raw materials and trying to find solutions that circumvent that problem and go for much more easily available minerals.



Taranjit Singh Sandhu, Ambassador of India to United States

Protectionism

Countries have to protect themselves from the onslaught of Chinese equipment. India is increasing the customs duties and so on. More countries will do that to try to develop energy supply chains within their borders. Along with that there will be incentive programmes and subsidy programmes. In the US, the Inflation Reduction Act (IRA) has totally upended the global energy supply chain. Entire industries, that are based on energy as an important input cost, are now thinking of relocating to the US. It will lead to a confused policy environment globally as other countries will take steps to protect themselves. Protectionism and trade distortions are a possibility in the clean energy value chain going forward.

India-US Partnership in Green Energy

The US will play a pivotal role not only in supporting India's rise as a global power but also in supporting India's rise as a global superpower for green energy. From an innovation perspective, for instance, an American company (Bloom Energy) makes electricity from gas without burning it. Its technology was developed by an Indian-American scientist along with colleagues from NASA for a Mars mission. The scientist left NASA, reverse engineered the technology to produce electricity by using any gas – natural gas, bio gas, hydrogen, and so on, by passing it through alloy and ceramic plates. It never combusts. The company is working with Indian partners to figure out how to scale it up to India's needs. It could be transformational.

Indian Players in Green Energy Innovation and Investment

Some of the most important global players in this space are in India. The Adani Group announced 3 Giga factories to produce solar modules, wind turbines, and hydrogen electrolyzers as part of a USD 70 billion green energy initiative. The Reliance Industries Limited (RIL) announced USD 75 billion in investments in renewable energy; they have a goal of transforming all their worldwide operations to net zero emissions by 2035. RIL Chairman Mukesh Ambani has said India will become the world's largest exporter of green energy.

Pathways to Net Zero

Three Building Blocks for India's Net Zero Journey

- Progressive central government policies - Building capacity will be one of the biggest challenges for India, especially at the state and district levels. The kind of pressure to achieve net zero will enable a better understanding of what the states, districts, and other entities must do.
- Strong emphasis on innovation, technology, and doing things in new ways - Attempts should be made to find solutions that will hasten this process.
- Industrial policy - There is a competition around the world to give subsidies for various things, whether it is semiconductors, solar, electric vehicles (EVs), batteries,



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etc. This will increase the pressure and the race to innovate. In India, 3 million EVs were made and sold in 2022. Most of them were two and three wheelers. There is momentum in areas of green hydrogen and solar PVs. The whole journey for net zero is on its way.

Multi-Partisan Support

In India, the net zero commitment scheme came from the central government but currently at least 15 state governments, run by different political parties, are working on their net zero pathways.

Criticism of Net Zero Approach

It takes the emphasis away from gross emissions. Just considering offsets is not necessarily the right approach to get to low emissions. In this context, this is a good journey to create ambition loops and action plans.

Three Focus Points - Leadership, Partnership, and Momentum

- On leadership, sustained high level political commitment is absolutely critical. India and the US have not

particularly succeeded on this front. But the April 2021 US India Climate and Clean Energy Agenda 2030 partnership launched by President Biden and Prime Minister Modi represents a significant investment of political capital and intention to have sustained effort down this road. The US is committed to sustaining the leadership with India in the spirit of collaboration, which will allow both countries to navigate the challenges of climate change. Even with sustained high level political leadership in India and the US, the amount of money brought in is relatively small. De-risking private capital and unleashing those capital flows would be a game changer. Both countries are industrial democracies, there is an immediate concern about livelihoods. There is political leadership in place now to help guide both countries but it will require constant effort and vigilance.

- Partnership is also essential. India and the US have a long history of partnership stretching back 75 years. In clean energy and climate, they have already dramatically expanded the use of renewable energy and reduced millions of tonnes of greenhouse gases each year and they continue to build on it. A partnership with the Indian railways enabled the installation of solar panels and energy efficient lighting and appliances across hundreds

of rail stations throughout India. Indian railways is committed to a net zero target by 2030. It will help scale up the adaptation of other new technologies like electric mobility across all sectors of the Indian economy.

- Lastly, momentum needs to be built by leveraging leadership and partnership to tie that with an animating vision for the future. The growth of the green building industry in India is illustrative of this, and points to some real possibilities for continued progress. In 2000, the United States Agency for International Development (USAID) began working with the Confederation of Indian Industries (CII) to integrate traditional Indian architectural designs with technological advances in solar energy, waterless sanitation, and super efficient appliances. The result was the Sohrabji Godrej Green Business Centre, the first Leadership in Energy and Environmental Design (LEED) certified platinum rated green building outside the US. It has served as a catalyst for the growth of green buildings across India and continues to chart a path forward, starting first with energy and moving towards net zero. The plan is to continue partnering with CII on scaling and accelerating renewable energy and energy efficiency solutions, and a more conducive enabling environment so that more private sector players engage in net zero. India's leadership, because of the scale and heft of the economy, will have global effects. USAID and the entire US government is looking forward to continuing the successful relationship with the government of India on the road to net zero.

Decarbonising Mobility

- Decarbonising mobility is at the core of achieving net zero. In June 2021, EV penetration was less than 1% and now it has crossed 6%. New vehicles registered in places like Delhi and Bangalore, penetration is in double digits. A lot of this comes from taking decarbonising to the user directly. So far, EV vehicles' focus was on building premium vehicles but a shift to the mass market is required. This is to ensure that every consumer can adopt it and become a part of this journey. For this to happen, investment into technology is important. There are two ways to look at it.
 - ~ One, EVs provide an opportunity to enhance consumers' experience on what an automotive can do. Integrating that with software gives an opportunity to elevate the consumer's experience and give them a strong positive push towards adopting EVs. It is not just about climate, it is also about providing a better product. Technology also needs to work on reducing the fundamental cost structures of vehicles. This is not only about reducing the cost of batteries, it calls for the industry to deeply look at what they have been

doing and see what opportunities lie to build EVs to the mass market. It requires innovation and investment into cell technologies, technologies beyond lithium, so that the cost structures can further improve.

- ~ Second, this needs to be looked at as a moment where securing energy and battery production from a supply chain standpoint. It is important to build this deeply, and for industries and governments to partner in creating these avenues. The overall lithium ion requirement will cross more than 4000 gigawatt. It should be made sure that a big part of that production and abilities are present in India.
- Years ago, China had a similar problem with regard to air quality as Delhi is currently facing. Their reaction was to ban all internal combustion engine two wheelers. The situation today in a lot of cities in India is like that. From a policy perspective, it needs to be allowed. India brought in emission norms for vehicles but enforcement was a problem. Now that India has an ecosystem and an industry that is ready to skyrocket, this is the time to push for a policy to ban all non-electric two wheelers in major cities.

Global Energy Transition

- The Systems Change Lab report gives examples of what is needed to get on track to meet climate and biodiversity and equity goals. For example, public and private climate finance needs acceleration by more than 10 times to reach approximately 5.2 trillion by 2030. Carbon intensity of cement production needs to be lowered more than 10 times faster, public transportation systems need to be expanded six times faster etc.
- The world is running out of another percentage point of the remaining carbon space that gives a chance of staying within 1.5 degrees. On average, the world is at 1.1 degrees and South Asia has warmed up more than that. The long held assumption that the rich can escape and the poor will adapt, actually no longer holds.
- Energy transition will look different in different countries. Countries like the US and India have to advance climate solutions that drive economic growth and benefit citizens. The IRA in the US was a politically difficult bill to pass. But it passed because of exactly this opportunity, nearly USD 400 billion that will go to clean energy and climate solutions.

India's Energy Transition

- India is a fast growing economy, with young talented

workers. It is adding renewable electricity faster than any other major economy and is investing in clean technologies.

- The price curves of renewable energy show an astonishing decline in reduction of cost in the last 10 years – 90% in solar, 60% in wind and so on.
- Electric vehicle sales went from 1.5% to 19% in a two year period.
- There are incredible exponential curves of dissemination with tremendous amounts of renewable energy spreading through economies.
- There are predictions which suggest that low carbon technologies could be a USD 80 billion market in India by 2030.
- The National Green Hydrogen Mission is a great example. Another example is the National Solar Mission. When it was launched, there was less than 20 megawatts of solar. Today there is more than 60,000 megawatts of solar, 166,000 megawatts of non fossil electric capacity.
- India is committed to build 500,000 megawatts of non-fossil Rural Electrification Corporations capacity by 2030. If successful, India would be the first major economy that builds more renewables this decade than its entire electricity system.
- India's net zero modelling suggests that by 2070 India will require 5.6 million megawatts of solar capacity alone. So every year, the curve has to keep shifting up in an exponential way.
- How India deals with market failures on one hand and political failures on the other hand will be crucial.

~ Market failures

- The first market failure is that India does not have capital that is de-risked at scale, that will then crowd in the trillions of dollars that are needed to the billions who live in the Global South. India, for instance, is already the world's third largest renewable energy market and yet in 2020 it received only 2% of global renewable energy investment. Money is not flowing where the sun shines the most.
- The second market failure is not pricing externalities.
- The third market failure is material efficiency. India will not be able to build out this electric mobility

revolution if there is no massive increase in the circularity of the materials, minerals, and metals that go into building infrastructure.

- The fourth market failure, which is perhaps a point of dissonance between India and the US, is the recently launched Mission Life by Prime Minister Modi in the presence of the UN Secretary General. It is not a fluffy afterthought, it is actually central to the requirements of India's sustainable pathway. So it is not just about nudging individual behaviour, it is about enabling markets for circularity.
- ~ Political failures
 - The first political failure is the orderly transition that will be needed not just for fossil fuel assets but of people dependent on fossil fuel infrastructure. This will be a challenge across the world. If it is not solved there will be enough political veto points to stall this transition.
 - The second political failure is the risk of industrial policy becoming protectionist. The trade/investment rules need to be thought of which mitigate that potential risk.
 - The third political failure is that India is not partnering enough. It can make progress on technology much faster if they are pulling capital, human resources, technological resources, and doing it faster than if India did it alone.
 - The fourth political failure is lack of accountability in what India is promising. The COP negotiations have become mutual admiration societies. Every year countries come in and make new announcements.

MDB Reform

- The combination of multilateral development banks (MDBs) can be effective. There are a number of steps that they can take if they are pushed by their shareholders. Their shareholders are the big countries in the world, most particularly US and other G7 countries but also G20 countries.
- MDBs require practical reform. For instance, the Multilateral Investment Guarantee Agency (MIGA) was set up to deal with political risk. It has only had one payout in over three decades.
- Annual climate change negotiations disappoint developing nations because money is not flowing with a focus.

Fundamentally, money needs to come from government coffers. But developed countries are limited by their own political systems.

- One of the two tracks of the climate and clean energy agenda 2030 partnership is on climate action and financial mobilisation. They have discussions with both Indian financial institutions and global financial institutions to explore developing scalable business models in India for India and other concerns like tackling loan portfolio guarantees to get better flows of private capital.

Developing New Technologies

According to the International Energy Agency (IEA), about half of the emission reductions required by mid century will come from technologies that are not yet on the market. There is an opportunity for the US and India to work together on the seeds of bringing some of these new technologies to market and make the public and private sector work together to develop new technologies and scale them.

- The benefit and the possibilities of involving bamboo, some of the largest bamboo forests are located in North East India, in the construction industry should be considered.
- There is an interesting climate smart agriculture experiment in Andhra Pradesh, India.
- The Great Green Wall in Africa is a nature based solution.
- Direct air capture and ocean based carbon dioxide removal are also in the research stage.

Biodiversity Conservation

- The 30 by 30 commitment was recently added to the Convention on Biological Diversity. If 30% of land and sea is conserved it will not only protect biodiversity, but will also preserve carbon stocks which will in turn preserve standing forests that absorb carbon in a way which will be important for climate and for local economic security and environmental security. It is all integrated.
- Partnerships on reversing degradation of forests by encouraging tree growths outside of traditionally forested areas are taking place. This is important both for the carbon sequestration effects and for biodiversity.

Carbon Tax

- In both India and the US, the response to carbon tax is always politically infeasible. In the last year and a half because of the volatile energy pricing issue and the



Amitabh Kant, G20 Sherpa, Government of India

increase in prices there has been demand for energy conservation like never before.

- Cement industry in India is the most energy efficient industry because of the indirect carbon tax and very high tariffs. There is also direct carbon tax on coal. The tariffs of energy are so high that the incentive to save is high, therefore, there is an increase in energy efficiency requirements.

Three Stage Approach

- First is nudging behaviour. It comes through a conscious effort whether it is the millets movement that India is promoting or it is a shift towards electric public transport through mass procurement.
- Second is enabling markets. Once demand is created, there has to be a response to it where investment comes in.
- Third is the policy framework and redefining aspirations. There is an economic underpinning.

Heat Risk

The corollary to heat risk is the cooling demand which is growing exponentially. The demand for energy will grow enormously as a result of that. There have been lots of thoughts in the past, about India and the US getting together on alternates for cooling. Penetration on cooling is so low today, whether it is for office, home, factories etc.



L–R: **Sumant Sinha**, Founder & CEO Renew Power; **Vivek Lall**, Chief Executive, General Atomics, Global Corporation; **R. Mukundan**, CEO, Tata Chemicals; **Soma Banerjee**, Head of Policy and Regulatory Affairs, BP India; and **Arunabha Ghosh**, CEO, Council on Energy, Environment and Water

Takeaways from Keynote Conversation

Energy crisis and clean energy transition

- Even with the energy and the commodity markets spinning and even with countries having to rely a little more on fossil energy, major investments in clean energy development not only continued but also deepened.
- Solar is the cheapest form of energy and if storage of renewable energy becomes clean, dispatchable, inexpensive baseload power, the mother lode would have been hit.
- According to the IEA, the global renewable energy capacity is supposed to grow by 2400 gigawatts by 2027. That is roughly China's capacity for power generation today.
- The big picture takeaway that the world has learned from the energy crisis is that the only real solution to the challenges around security and independence is really to accelerate the clean energy transition.
- It has to be a managed transition, the focus should be on diversifying supplies, speeding clean deployment, and improving energy efficiency. Fossil fuels will be around for a long time.
- The US has been working with India and other international partners to bring stability back to the energy and commodity markets, even as there is continued increased investment in clean energy alternatives to make them even more cost competitive and widely available.
- Clean energy is increasingly the most affordable path. It has proven itself to be more resilient than fossil fuels in the face of hurricanes, wildfires, and other climate impacts. It is a driver of economic growth. The job creation in emerging high potential industries in this sector – 40 million people worldwide work in clean energy industries today which is only going to grow as the global demand for these clean energy products accelerates. India stands to benefit from that enormously.

Strategic Clean Energy Partnership (SCEP)

- The bilateral SCEP gives a strong platform to focus on the shared decarbonisation challenge.
- The US and India are the second and the third largest greenhouse gases emitters in the world.
- India imports USD 20 billion worth of energy goods from the US. There is potential for US production to grow.
- There is collaboration to advance key technologies through the critical stages of the innovation lifecycle. Information and best practices that can speed up R&D are shared. They have started forming investment partnerships that can help take these technologies to market and get them to scale. Policy and regulatory reforms are being discussed which can accelerate deployment of next generation clean technology required for collective climate goals from clean hydrogen. These collective efforts will not only accelerate progress toward their common clean energy goals, but will also make these clean energy solutions available to benefit the global community.
 - ~ There is a team spanning 30 universities in both countries working together to test new systems and software tools for effective and reliable grid management.
 - ~ Through programmes like Solar Decathlon India and the building innovation workshop series, they are filling up their talent pools of upcoming business professionals, engineers, builders, architects, who will make high performance zero energy buildings.
- For the US, their relationship with India with regard to energy is most important in the world and most important for the world. Most important in the world because many American energy objectives are only possible through cooperation with India, whether it is creating a global clean hydrogen sector or reducing methane leaks in the global oil and gas sector. Most important for the world because if India can reach its ambitious targets like Prime Minister Modi's aim to get 500 gigawatts of renewable power deployed by 2030, it will put the world's collective climate and growth aspirations in reach.
- A green hydrogen dimension was added to the SCEP. The vision is – one kilogramme of green hydrogen for USD 1 for 10 years. Bulk of the green hydrogen is manufactured in the town of Houston. India needs clean green solar energy at a reasonable cost. India has brought down the cost per unit of solar energy from 25 cents to 3 cents. Every electrolyser manufacturer in the world is now tied up with Indian companies. In India, different parts of

the government are now addressing the green hydrogen mission on a war footing. There are six departments of the government, which will be looking at green hydrogen in their own domains. The target is to reach 5 million metric tonnes by 2030.

Ethanol

An MoU was signed between the US Grains Council and Society of Indian Automobile Manufacturers at the 2023 Auto Expo which entails knowledge transfer on ethanol technology. A deal was also signed with Brazil. India's biofuel blending which was at 10% earlier will reach 20% five years ahead of its target date of 2030. India is making 90 million litres of second generation ethanol from agricultural waste and bamboo.

Flexi-fuel

In the Auto Expo, there were many vehicles which provided the possibility of a flexi fuel usage between 20% and 85%. In India, e10 petrol is available in 98% petrol pumps. Biofuel will start as a pilot project and then it will be scaled up till they get 100% e20. The automobile manufacturers who sell flexi fuel engines in Brazil and other parts of the world are ready to launch them at different points of time. EVs are being rolled out in large numbers but their grid has to be green too. Flexi fuel engines provide the possibility of a hybrid car using green hydrogen cars using a high percentage of biofuel.

Green ammonia

Germany based company Uniper has signed an agreement with an Indian company to source green ammonia. An MoU has been signed between India and Singapore as part of which India will supply green ammonia. India is ready because demand has been created, there is production capacity, and consumption will follow.

Clean Hydrogen

- Global standards of clean hydrogen are required. There is inter-agency talk between India and Europe for the same.
- The electrolyser piece is the biggest expense of hydrogen. Its manufacturing needs to reach that scale and have it be a production line which will reduce the cost.
 - ~ In India there is now an administering mechanism which is called an empowered group for decision making and an advisory group backing it up. A provision for a PLI scheme for electrolysers has received funding of around INR 19800 crores.



L–R: **Stephen Biegun**, Former US Deputy Secretary of State and **Eileen Laubacher**, Special Assistant to the President & Senior Director for South Asia, White House National Security Council

- The attempt is to move away from colours and move towards low carbon. A series of pilots across the US are identifying the best practices for a variety of inputs and off takes of clean hydrogen.
 - ~ For example, USD 7.5 billion was put out as a competition for regions across the country, 79 proposals were received from regions which wanted to be hydrogen hubs. That will be narrowed down to 10 essential major demonstration projects on various types of low carbon emitting or no carbon emitting hydrogen.
- There are inputs of nuclear power to be able to generate clean hydrogen.

India's Oil Marketing Companies (OMCs)

OMCs are taking to green hydrogen. There is going to be a robust discussion on how to use green hydrogen in different sectors of the economy in different production processes. In India, about 60 million people go to the petrol station everyday. A large proportion of that is of two-wheelers which are already operating on replaceable batteries. Some of

the OMCs (Indian Oil, Bharat Petroleum, and Hindustan Petroleum) have set net zero targets of their own. Such targets are usually set by developed industrialised economies. Going forward, green hydrogen collaboration and sharing of best practices through private sector mechanisms is also a possibility. In anticipation of a government policy, the private sector had already positioned itself with foreign investment.

US Transportation Sector

- The US released its blueprint on how to get to net zero in the transportation sector – sustainable biofuels and sustainable aviation fuels are going to be a part of that. The strategy is to provide incentives for the production of those fuels.
- A goal of getting to 100% clean electricity on the grid by 2035 has been set by the US. Then the move towards electrification can be accelerated, especially that of the passenger fleet.



*L-R: **Todd Stern**, Former US Special Envoy for Climate Change; **James Abraham**, Trustee, Ananta Aspen Centre; and **Janmejaya Sinha**, Chairman, Boston Consulting Group India*



*L-R: **Tarun Das**, Founding Trustee, Ananta Aspen Centre and Former Director General, Confederation of Indian Industry (CII); **Montek Singh Alhuwalia**, Distinguished Fellow, CSEP & Former Deputy Chairman of the Planning Commission of India; and **Naushad Forbes**, Chairman, Ananta Aspen Centre & Co-Chairman, Forbes Marshall*



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***Anne Neuberger**, Deputy National Security Advisor Cyber Security and Emerging Tech, US*



L–R: Elbridge Colby, Principal, Marathon Initiative; William Blair, Chief Executive, Lockheed Martin India; Banmali Agrawala, President, Global Corporate Affairs, Defence and Aerospace, Tata; Lindsey Ford, Deputy Assistant Secretary of Defense for South and Southeast Asia, US; Paul Jones, Vice President, International Government Relations, Raytheon; and Daniel Twining, President, International Republican Institute



A view of the audience at the Forum

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