

India—Japan Business Potentials (From NEDO's Perspective)

November 2022

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Overview of NEDO

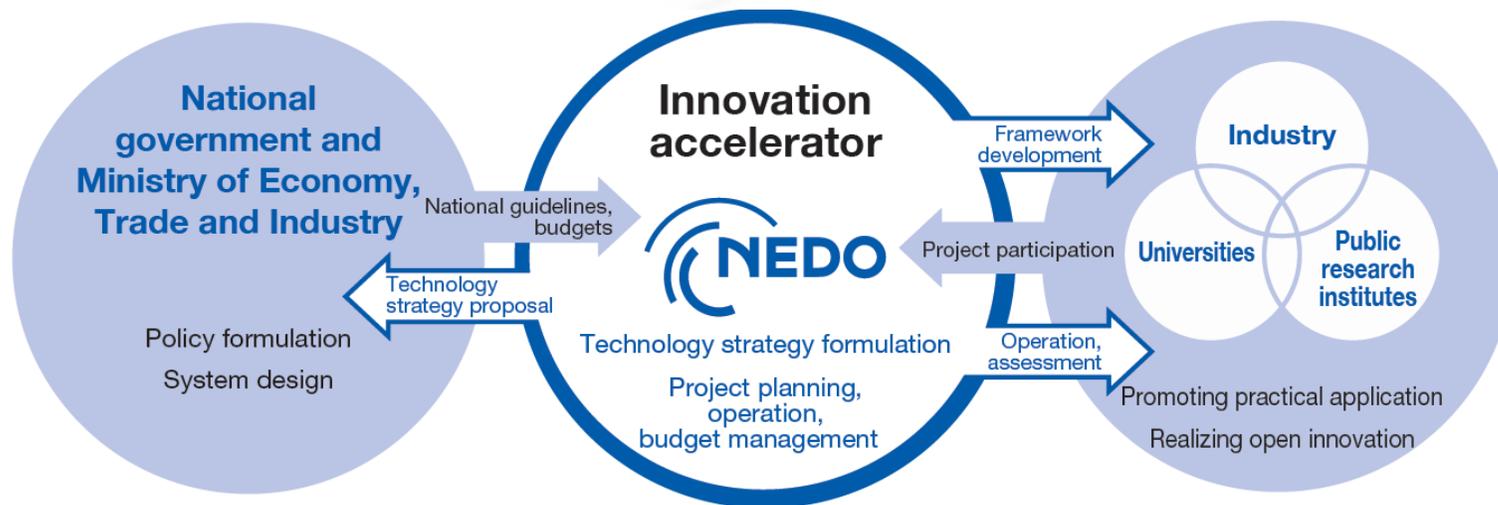
(New Energy and Industrial Technology Development Organization, under METI, Gov. of Japan)



Positioning of NEDO

- In its role as an **innovation accelerator**, NEDO formulates project plans and establishes project implementation frameworks by combining the capabilities of industry, academia, and government, including public solicitations of project participants.
- NEDO carries out research and development projects and set targets based on changes in social conditions in order to realize maximum results.

Head Office:	Kawasaki City, Japan		
Personnel:	1,256 (as of 1 st April, 2021)		
Budget:	Approx. \$1.28 billion (2022FY) * \$=122 yen		
Fund:	Green Innovation	\$16.39	billion
	Semiconductor	\$5.06	billion
	Post 5G	\$2.54	billion
	Economic Security	\$1.02	billion
	Moonshot	\$207	million



6 Overseas Branch Offices



NEDO's Targeting Technologies



Renewables



Energy Conservation



Electronics / ICT



Materials/Nanotech



Hydrogen / Battery



Water Treatment

Smart Community



Environment/
Next Generation
Thermal
Power/CCUS



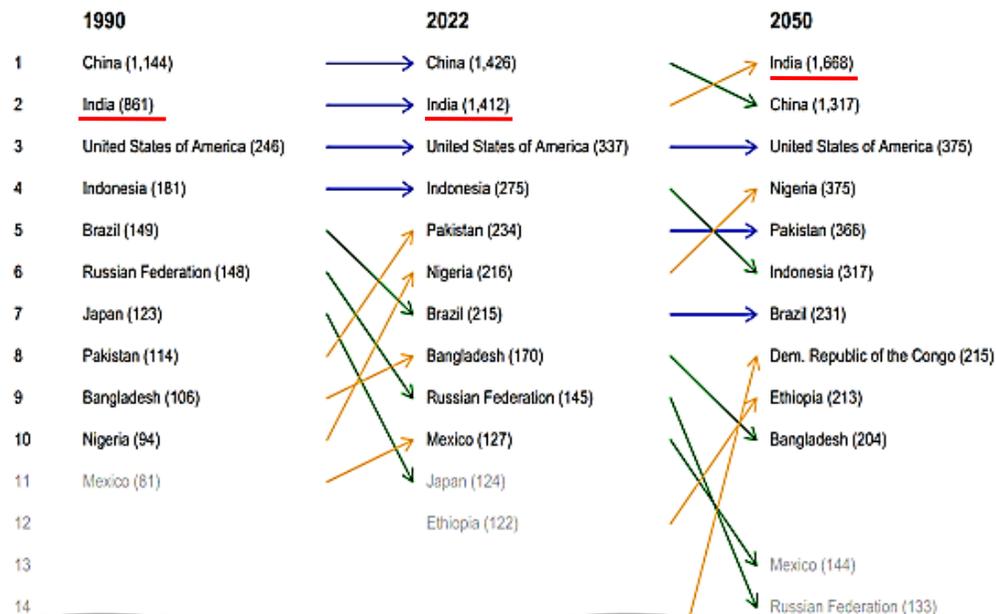
Robotics/AI



India's Growing Market

- India is projected to surpass China as **the world's most populous country in 2023**.
("World Population Prospects 2022" by UN)
- Also, India has **the largest youth population in the world**; around 66 per cent of the total population (more than 808 million) is below the age of 35. (ILO)
- **"Economies of scale"** (⇒cost down) is being pursued against the backdrop of a huge market.

World Population Prospects 2022



World Top10 Economies in 2050 (GDP at PPP)

	2016	2050	
China	1	1	China
US	2	2	<u>India</u>
<u>India</u>	3	3	US
Japan	4	4	Indonesia
Germany	5	5	Brazil
Russia	6	6	Russia
Brazil	7	7	Mexico
Indonesia	8	8	Japan
UK	9	9	Germany
France	10	10	UK

E7 economies
 G7 economies

Sources: IMF for 2016 Estimates, PwC analysis for projections to 2050

Latest World Economic Outlook Growth Projections



(real GDP, annual percent change)	PROJECTIONS		
	2021	2022	2023
World Output	6.0	3.2	2.7
Advanced Economies	5.2	2.4	1.1
United States	5.7	1.6	1.0
Euro Area	5.2	3.1	0.5
Germany	2.6	1.5	-0.3
France	6.8	2.5	0.7
Italy	6.6	3.2	-0.2
Spain	5.1	4.3	1.2
Japan	1.7	1.7	1.6
United Kingdom	7.4	3.6	0.3
Canada	4.5	3.3	1.5
Other Advanced Economies	5.3	2.8	2.3

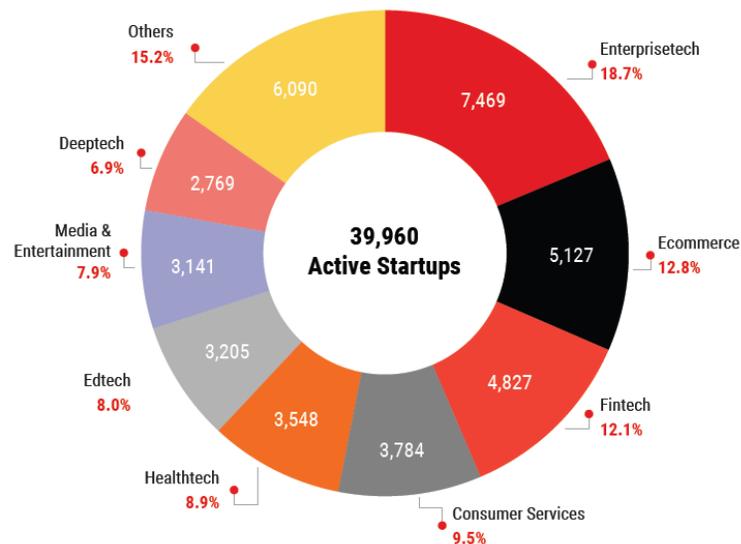
Emerging Market and Developing Economies	6.6	3.7	3.7
Emerging and Developing Asia	7.2	4.4	4.9
China	8.1	3.2	4.4
<u>India</u>	<u>8.7</u>	<u>6.8</u>	<u>6.1</u>
ASEAN-5	3.4	5.3	4.9
Emerging and Developing Europe	6.8	0.0	0.6
Russia	4.7	-3.4	-2.3
Latin America and the Caribbean	6.9	3.5	1.7
Brazil	4.6	2.8	1.0
Mexico	4.8	2.1	1.2
Middle East and Central Asia	4.5	5.0	3.6
Saudi Arabia	3.2	7.6	3.7
Sub-Saharan Africa	4.7	3.6	3.7
Nigeria	3.6	3.2	3.0
South Africa	4.9	2.1	1.1
<i>Memorandum</i>			
Emerging Market and Middle-Income Economies	6.8	3.6	3.6
Low-Income Developing Countries	4.1	4.8	4.9

Sources: IMF, World Economic Outlook, October 2022

Huge Startup Market in India

- India has **3rd largest startup ecosystem in the world** (**107 unicorns** with a total valuation of **\$ 340.79 Bn.**, as of 7th September 2022).
- The rise of the startup market (so-called “**Next Silicon Valley**”) is backed by the spread of smartphone and Internet, high-level human resources from universities such as IITs, and large amounts of data.
- Japanese companies are expected to make investments and collaborate in joint research and business in the Indian market as a “big testing field” supported by its huge market.

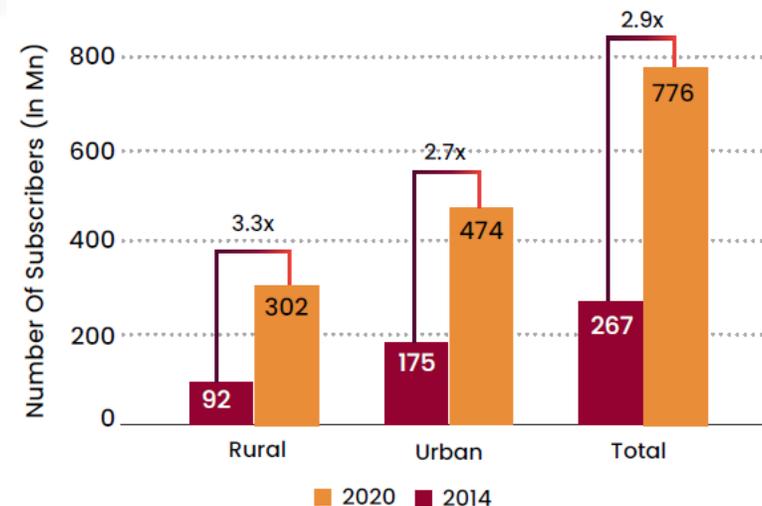
Sector-wise Indian Startups



Sources : Inc42 Report

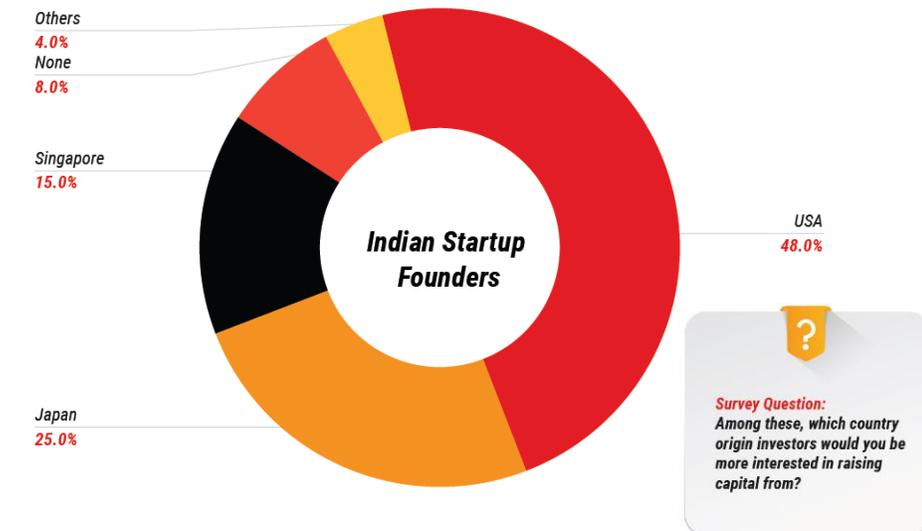
Growing Internet Penetration

57% Of The Indian Population Had An Internet Subscription In 2020 Compared To 21% In 2014



Sources : Inc42 Report and TRAI

Japan Emerged As The Second Most Popular Choice Among Indian Founders For Raising Foreign Capital



Sources : Inc42 Report

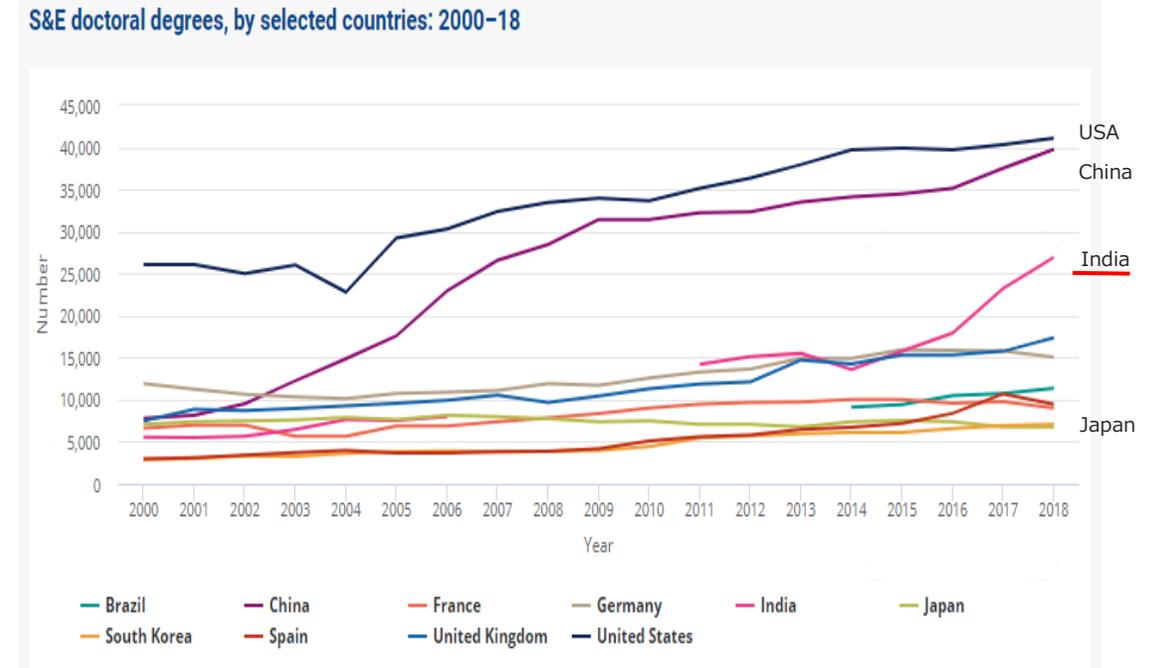
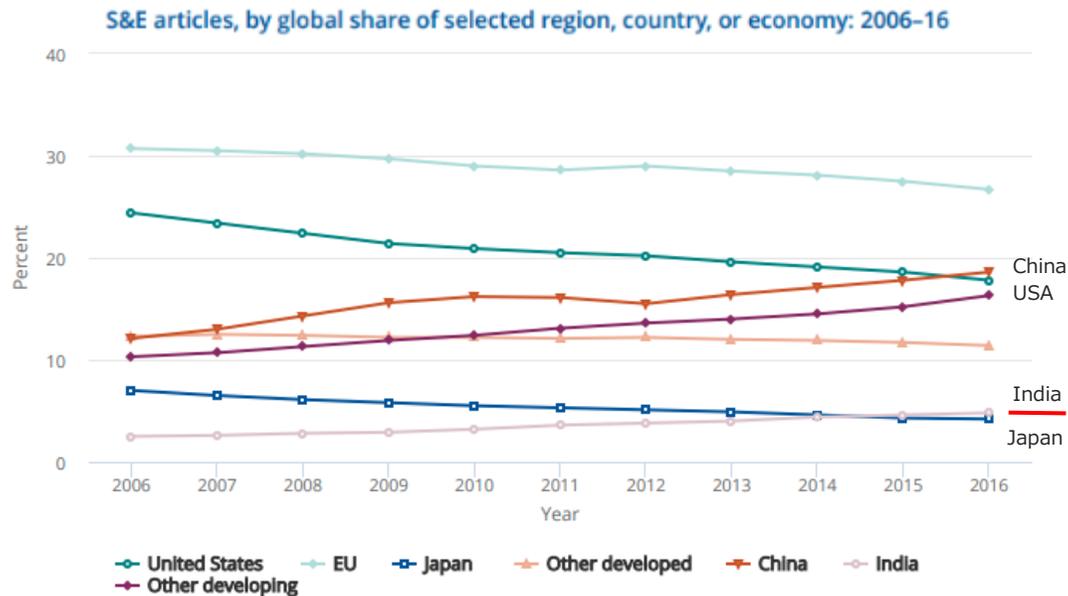
Science & Technology Level has been increasing

- **The importance of India's papers in the field of S&T has increased.**

The number of them increased 7 times from 21,400 (2000) to 149,200 (2020). Its global share has increased every year (third in the world). (✂Japan's number of papers in this field was surpassed by India's in 2015)

They have strengths in **chemistry, materials science, physics, computers & mathematics, and engineering.**

- The number of **doctoral degrees in S&T** in India has shown rapid growth in recent years.



Sources : NCSES, special tabulations (2018) by SRI International and Science-Matrix of Elsevier's Scopus abstract and citation database.

Sources : NCSES, special tabulations (2021) by SRI International and Science-Matrix of Elsevier's Scopus abstract and citation database.

Make in India / Self-reliant India



- India has promoted the development of manufacturing industry with “**Make in India**” and “**Self-reliant India.**” Although it takes time to develop such industry due to the challenges of lack of enough infrastructure and human resources (labor law, etc.), Gov. of India has been actively promoting domestic production (through the **PLI**, which provides incentives for domestic production).
- Many of Japanese companies entering India are doing business related to **automobile sector**. Diversification into other industries is expected to expand in the future.
- Recent developments in the field of **electronic devices and precision machinery** in India should be remarked, such as the production of iPhones, and Vedanta and Foxconn's move to establish a semiconductor factory in India.

Targeted Sectors for PLI (Production-Linked Incentive)	Approved budget over a 5-year period (Bil Rupee)
Mobile Manufacturing and Specified Electronic Components	409.5
Critical Key Starting materials/Drug Intermediaries and Active Pharmaceutical Ingredients	69.4
Manufacturing of Medical Devices	34.2
Advance Chemistry Cell (ACC) Battery	181.0
Electronic/Technology Products	50.0
Automobiles & Auto Components	570.4
Pharmaceuticals drugs	150.0
Telecom & Networking Products	122.0
Textile Products: MMF segment and technical textiles	106.8
Food Products	109.0
High-Efficiency Solar PV Modules	45.0
White Goods (ACs & LED)	62.4
Speciality Steel	63.2
Drones/ Drone Components	1.2

Recent developments in Electrical device and Semiconductor manufacturing segment



Sources : Inc42



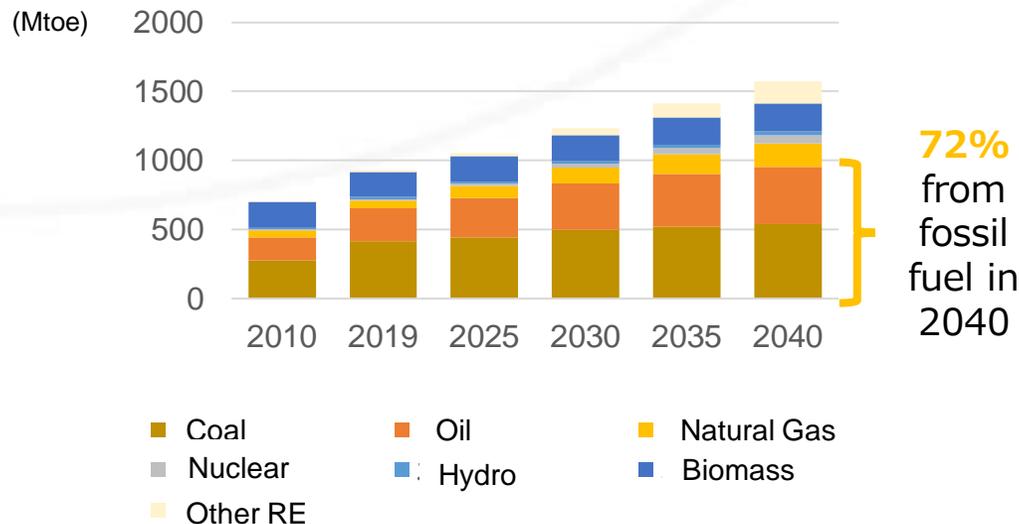
Sources : News18

- India is **the world's third-largest energy consuming country**, after China and US.

IEA estimates that by 2040, India's primary energy use will be 1.7 times larger than now, which almost equals to that of US. **Even in 2040, around 70% will come from fossil fuels.**

- As the volume of coal thermal power in India will keep increasing in the relatively short term, India aims for **realistic energy transition** as said by the Asia Energy Transition Initiative (AETI) led by Japan. The importance of technologies such as **ammonia co-firing, biomass co-firing and CCUS** are on a rise.

Projected demand for primary energy in India

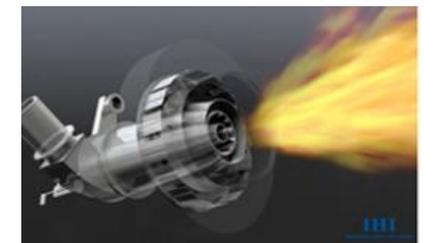


Sources : IEA "India Energy Outlook 2021" (p220)

Ammonia Co-firing demonstration (Pre-FS) projects by IHI and Kowa, collaborating with Adani Power.



Adani Power Mundra Coal Power Plant



Ammonia Co-firing Burner

Sources : IHI Website

Environment & Energy



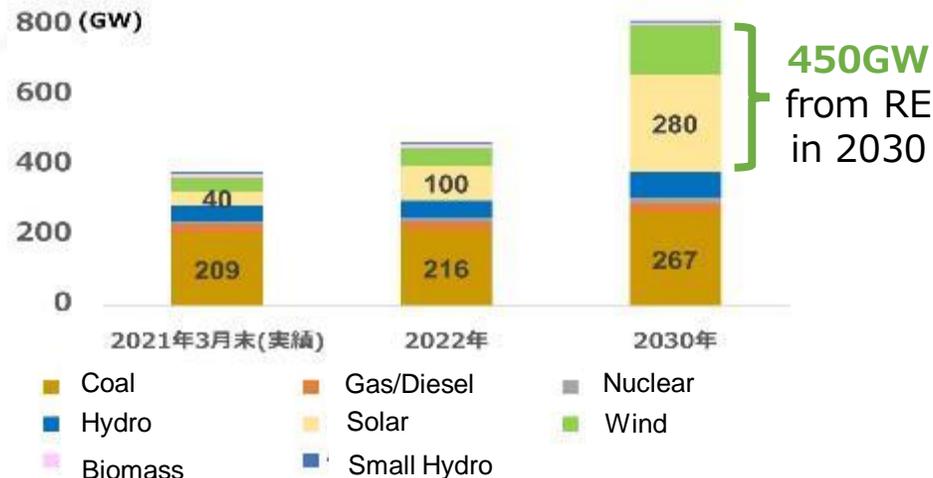
- **India is also active in introducing Renewable Energy (RE).** It should be noted that **the utilization of RE is proceeding simultaneously worldwide** (not necessarily led by developed countries), taking into account its geographical characteristics.
- For **solar**, the lowest price of 1.99 rupees (about 3 yen) was recorded in December 2020, and some projects of hybrid with wind and 24 hours supply has progressed since then. Due to competitiveness in RE, India is quite active in the introduction of **green hydrogen** and has provided policy support under the “National Hydrogen Energy Mission.”
- In addition, India has made progress in utilizing **biomass resources** (Bio-ethanol diesel, biogas and biomass co-fired).
- As above, India will promote the domestic production of energy and aim to transform it **from a “have-not” nation to a “have” nation.** As US and EU companies continue to collaborate with Indian companies, **there will be significant space for the introduction of hydrogen and other technologies developed by Japanese companies.**

Solar Power Potential



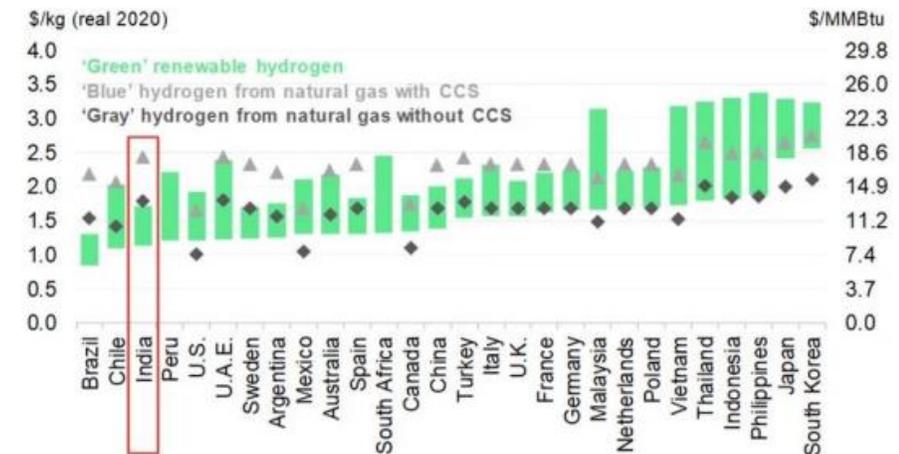
Sources : World Bank

Changes in power sources (Capacity-based)



Sources : CEA

Figure: Global levelized costs of hydrogen production, 2030 (\$/kg)

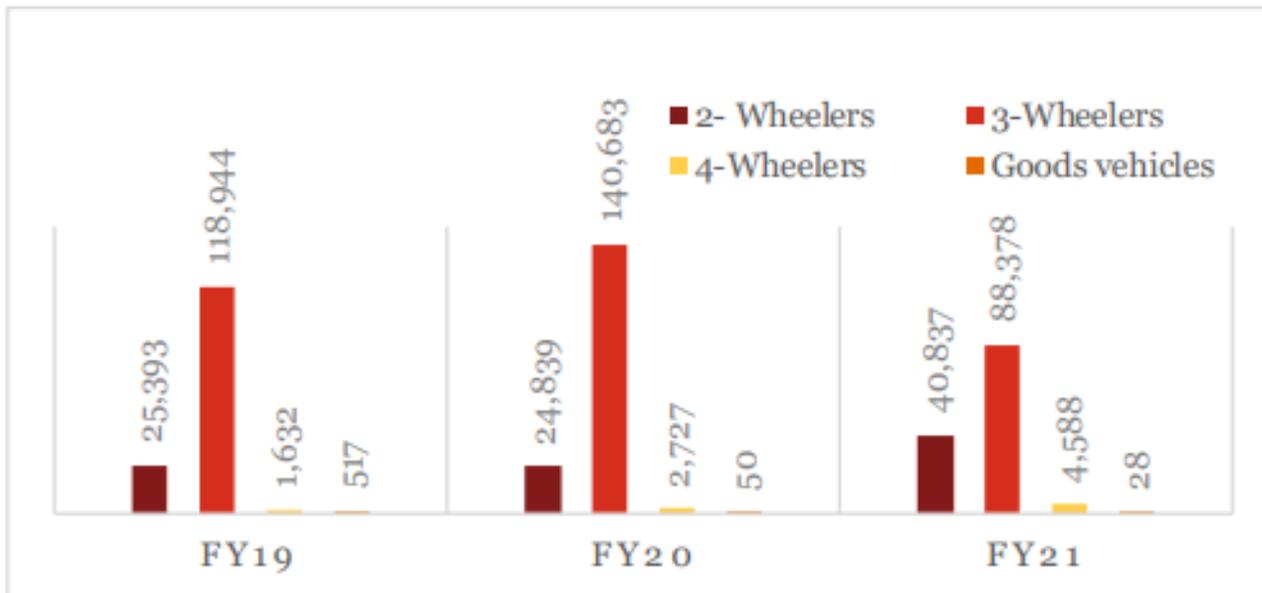


Source: BNEF, 2021

- Minister of Power announced that **30% of new sold car will be EVs by 2030.**
- In India, **2-wheeler EVs and 3-wheeler EVs are expected to become widespread.** Local manufacturers' competitiveness has increased sharply. (The Federation of Indian Industries projects an EV penetration rate of 25~35% for 2-wheelers, 65~75% for 3-wheelers and 10~15% for 4-wheelers by 2030.)
- **When getting eco-friendly 4-wheelers in India, it's not a binary choice between gasoline (hybrid) vehicles or EVs.**

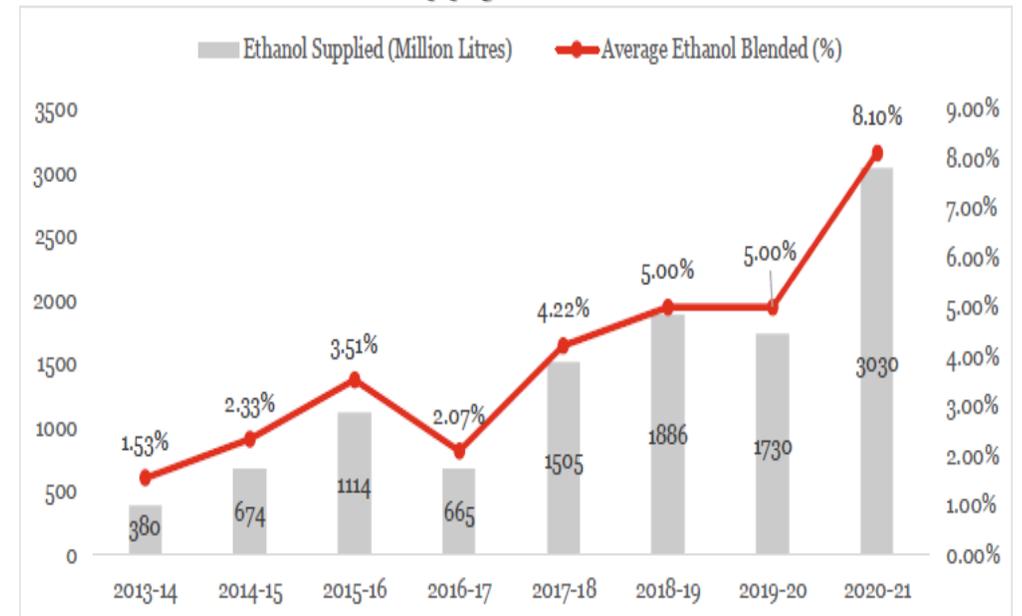
(There is a third option to use CNG, biomass, hydrogen, etc. 4-wheeler EVs will be aimed at high-income consumers due to their high prices.)

Category wise EV Sales



Source: PwC

Bio-Ethanol supply and blended share



Source: PwC

- In recent years, Japan, India, the United States and Australia have moved toward **QUAD**.
- Also, Japan, India and Australia have launched **SCRI (Supply Chain Resilience Initiative)** since 2021.
- Against these backdrops, it is expected that there is potential for collaboration (including technological collaboration) in the area of economic security between Japan and India.

Quad Leaders' Meeting

was held in Tokyo in May 2022.

The main outcomes of the Meeting are as below.

- Candid discussion on regional and global situations
- Further promotion of practical cooperation
- Confirmation on continued close coordination

SCRI (Supply Chain Resilience Initiative)

launched by Australian, Indian and Japanese Trade Ministers in April 2021

The Ministers noted the importance of risk management and continuity plans in order to avoid supply chain disruptions and affirmed their commitment to strengthen resilient supply chains. Possible policy measures may include: (i) supporting the enhanced utilization of digital technology; and (ii) supporting trade and investment diversification.



Sources : Japan's PM Office Website



Sources : METI Website

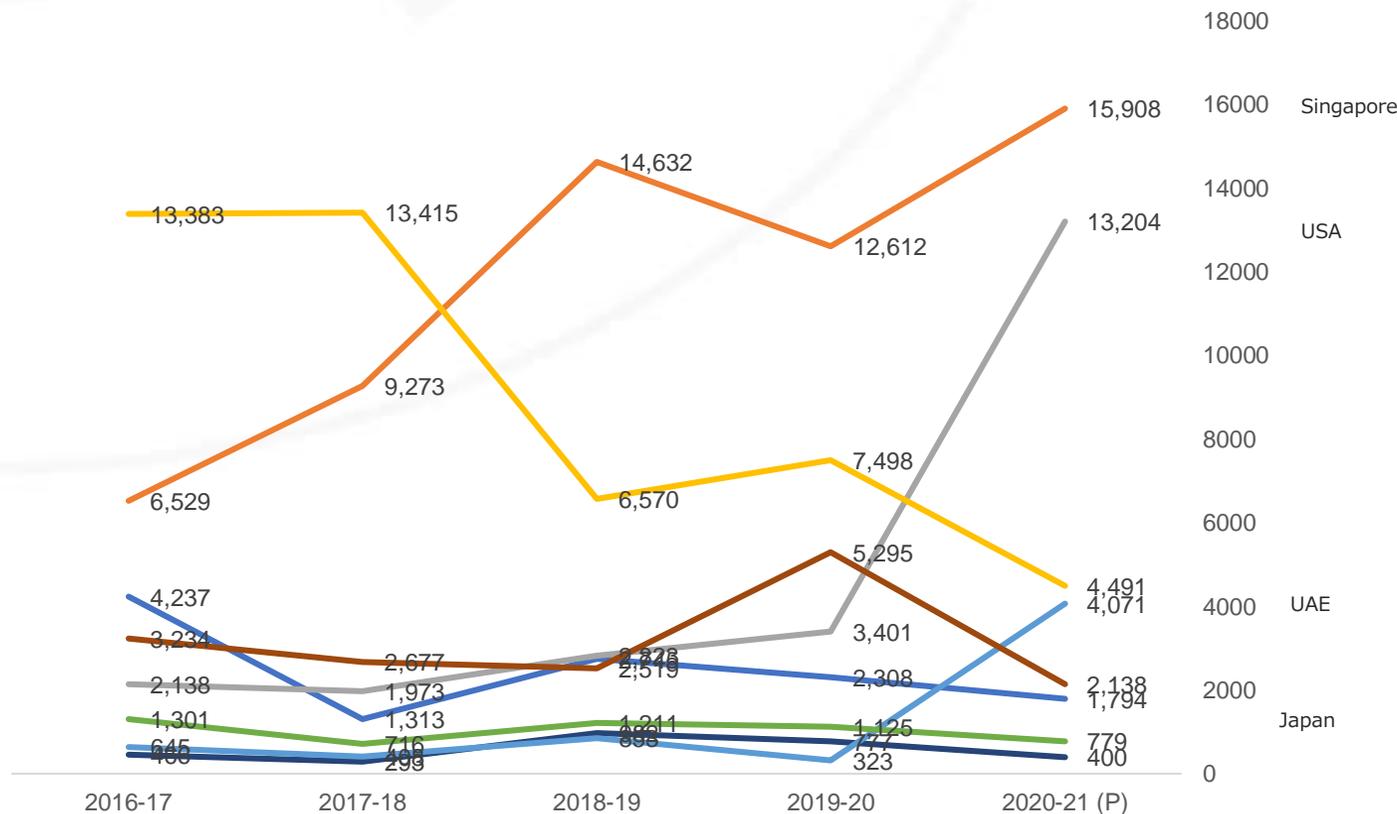
FDI (Foreign Direct Investment) into India



- **Total FDI inflows to India have been on an upward trend** for the last 5 consecutive years (FY 2021 ranked 7th in the world)
- Compared to Japan, which has seen a gradual decline in investment since the outbreak of the pandemic, the **US and UAE have increased their investment**, underscoring the strengthening of economic activities in India.

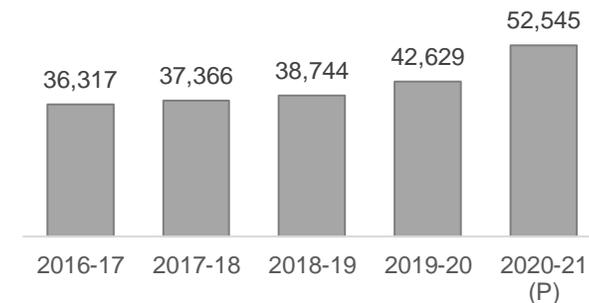
Country-wise FDI trend

Japan Singapore US Mauritius South Korea UAE UK Netherlands



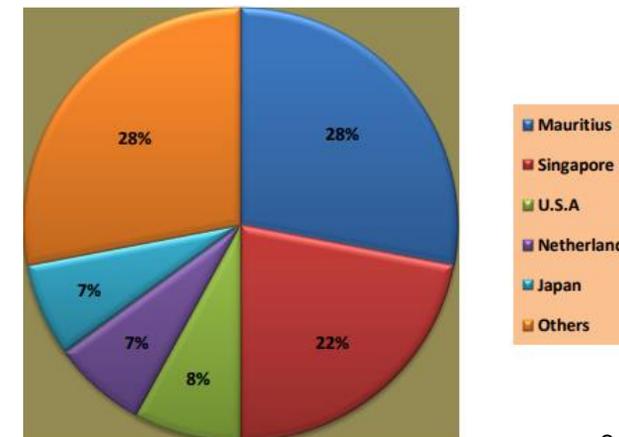
Sources : JETRO, based on the data from Reserve Bank of India

Changes in FDI to India



Sources : JETRO, based on the data from Reserve Bank of India

Total FDI amount (2000-2020)

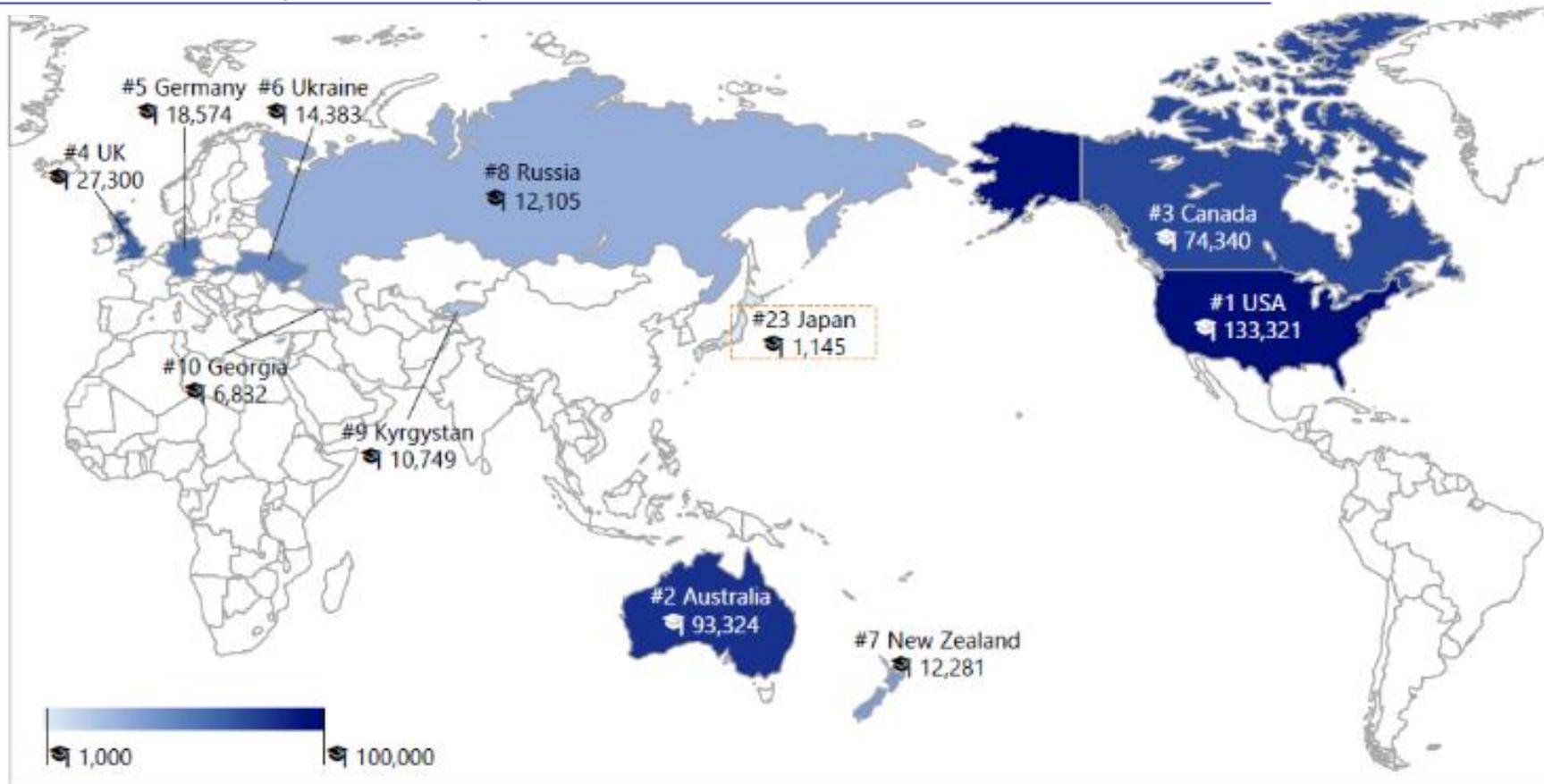


Sources : DPIIT Website

Indian Outbound Students

- Many of Indian students to study abroad choose US, Australia, Canada or UK.
- Only around 1,000 Indian students go to Japan (less than 1/100 of US), which rank 23rd in the world.
- It has been pointed out that one of the reasons is high language barrier.

Indian Outbound Students (Top 10 nations + Japan)



Approach to India ① - India's Market



- India is a cost-sensitive country and a certain level of **localization** will be needed by foreign companies.

⇒ **Separate core and non-core technologies, customize for the Indian market** (e.g. Remove unnecessary quality and functions as needed), and **work with local partners.**

- Emphasis is placed on **sales experience in India** as well, and **demonstrations for technologies that have not been proven in India are required** before such technologies can be introduced (Basically, companies that want to introduce technologies are required to pay their own costs).

⇒ **NEDO International Energy Demonstration Projects**



Sources: Auto Car Professional

NEDO Demonstration projects completed in India

- ① EMS for Multiple Energy Sources at Steel Plant (2021)
- ② Sinter Cooler Waste Heat Recovery (2014)
- ③ Coke Dry Quenching System (2011)
- ④ Utilization of Sensible Heat from Blast Furnace Hot Stove Waste Gas (2004)
- ⑤ Green Telecom Tower Project (2016)
- ⑥ Micro-Grid System with PV Power Generation (2019)
- ⑦ Highly Efficient Coal Preparation Technology (2014)
- ⑧ Smart Grid Pilot Project (2018)
- ⑨ Converting a Diesel Generator to Dual-fuel Operation (2011)
- ⑩ Regional Energy Efficiency Centre (2011)
- ⑪ ICT Based Green Hospital (2019)
- ⑫ Waste Heat Recovery System of Cement Plant (2004)

Approach to India ②

- World-class Human resources and Technologies



● There are difficulties for Japanese companies in recruiting Indian students.

- Companies should go to universities to recruit and offer jobs on the day of the interview. On the first day of recruitment (Day 1), many well-known tech companies, such as GAFAM, receive interview slots based on their past recruitment performance, and these companies quickly submit offers for high-ranked students.
- Base of such recruitment systems, Japanese companies might find difficulty in recruiting Indian students, partly because of their relative lack of name recognition.

⇒ Efforts to build relationships with universities and students prior to the recruitment date are important, through

- Offering internship opportunities
- Conducting Joint Research and Development (R&D)

● In such cities as Bengaluru and Hyderabad, global tech companies* are actively establishing R&D centers.

● Led by a team of talented Indians, they design world-class high-level and low-cost products and services.

* Microsoft, Intel, GE, Bosch, Siemens, Samsung, etc.

⇒ It is important to promote the establishment of global R&D centers in India.

It will be also effective in expanding business in Indian market through localization.



Japan Day 2022 (September 2022)

Job fair co-hosted by JETRO and JICA. Presentations were made by 10 Japanese companies at IIT Hyderabad. More than 300 students from IITH participated in the lively exchange.



In February 2022, Suzuki Motors signed a 3 year contract with IIT Hyderabad (IITH) to establish the Suzuki Innovation Centre.



In April 2022, Fujitsu established a new research hub "Fujitsu Research of India Private Limited (FRIPL)" in Bengaluru, with a focus on R&D in AI and quantum software.

⇒ JST, JSPS and **NEDO's schemes for supporting joint R&D between Japan and India**

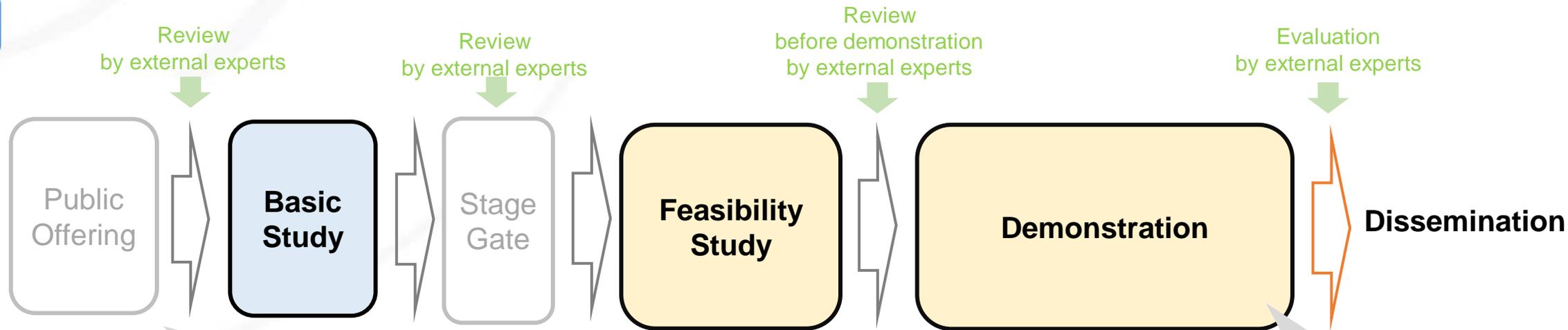
International Energy Demonstration Project



Purpose

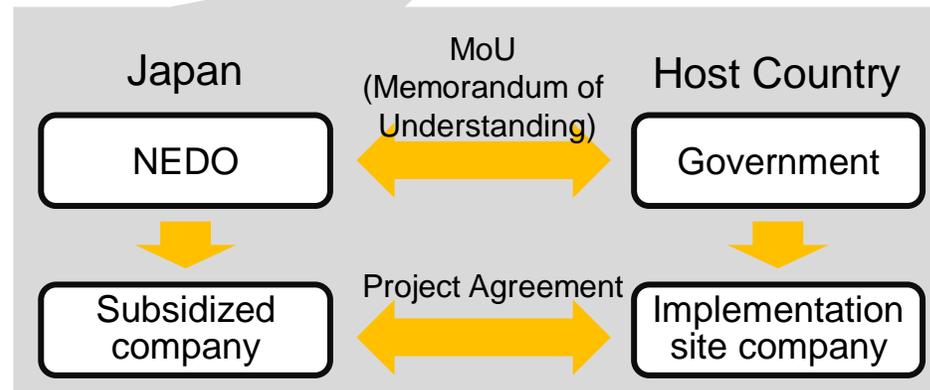
- ✓ Contribute to solving foreign energy problems through a demonstration of Japanese technology and systems for energy conservation.
- ✓ Contribute to obtaining energy security by reducing energy consumption through the dissemination of technology.

Scheme



2 public bids / year

※ Indian companies or universities may participate in the projects, together with Japanese companies which are supposed to apply for the offering.



Maximum for each project is around **3 Billion Rupees**

International Energy Demonstration Project (Current Projects)



Project	Companies	Period	Phase
<u>Micro-Substation for electrification</u> using transformers for Large-Capacity Instruments	Nissin Electric	2020~	Demonstration
<u>Electric Mobility Operation System</u> for realizing Last-mile Transportation	Panasonic	2020~	FS
<u>Empirical research about LNG delivery by Indian railways and improvement of cold chain infrastructure in India with LNG cold energy for the energy-consumption efficiency & the CO2-emission reduction</u>	Sojitz Corp. JR Freight Suzuki Motor Corp.	2021~	Pre FS
<u>Demonstration of Ammonia Co-Firing</u> at existing Coal Fired Power Plant in the state of Gujarat	IHI Corp. Kowa Company	2022~	Pre FS
<u>Study on Conformity with Demonstration Requirements for Hydrogen Technology to Achieve Efficient Thermal Operation</u> in Indian Factories	Yamanashi Hydrogen Company Suzuki Motor Corp.	2022~	Pre FS

NEW

NEW

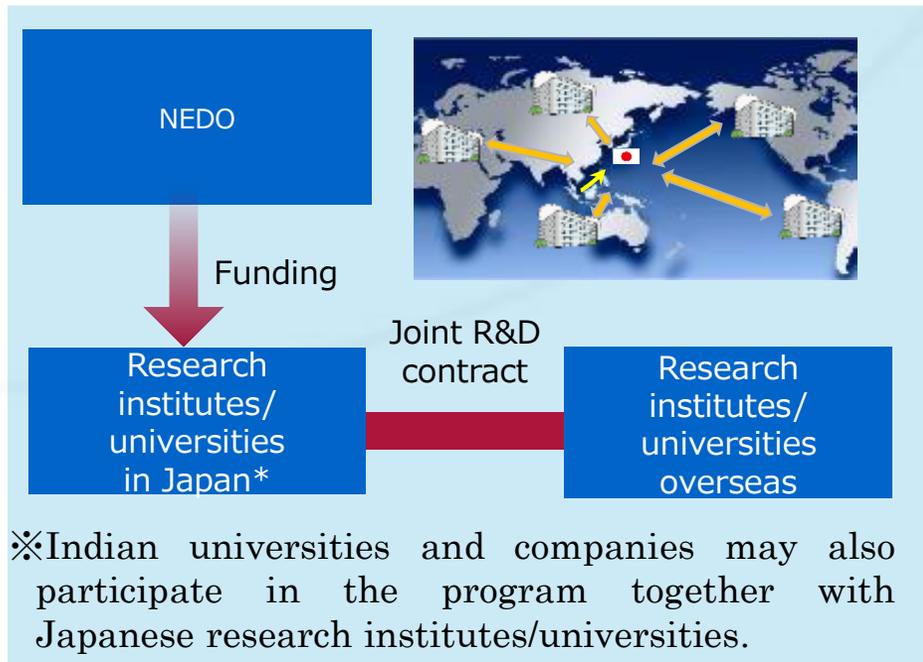
R&D Program for Promoting Innovative Clean Energy Technologies Through International Collaboration



● Program Outline

- ✓ The aim of this program is to develop and strengthen international joint Research and Development between Japan and other countries in order to create new and innovative clean energy technologies that will have practical use after 2030.
- ✓ This program supports Japanese research institutes and universities conducting joint international R&D projects with institutions from G20 member and other countries.

● Program Scheme



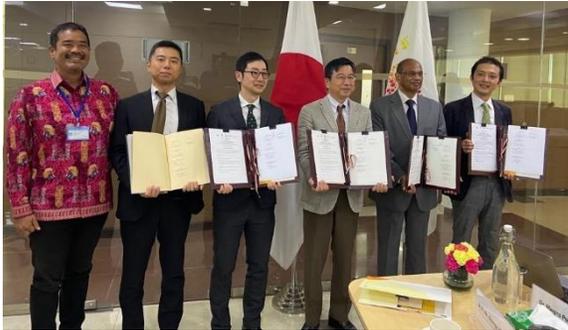
● Project Details

Project scheme	International collaboration between Japanese research institutes/universities and research institutes/universities overseas. Private companies may participate but only when research institutes/universities also participate.
Project budget	Maximum of almost INR 1.7 crores per project/per year. Note: NEDO will only fund the Japanese side of the international collaboration.
Project term	Maximum of 3 years.
Target technologies	- Clean energy technologies, including RE and energy-saving and environmental technologies that will have practical application after 2030. - 2 R&D themes have been selected for FY2022.
Project with NEW India-Japan collaboration	“Development of Innovative High-temperature Thermal Energy Storage technology” (Hokkaido univ., AIST, IIT Jammu etc.) has been adopted in FY2021.

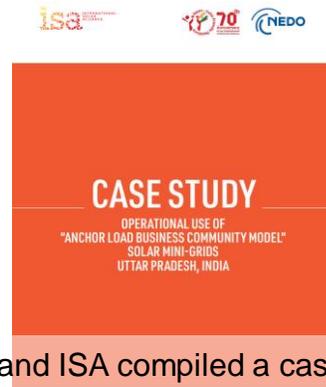
Examples of Collaborations by NEDO India



Collaboration with International Solar Alliance



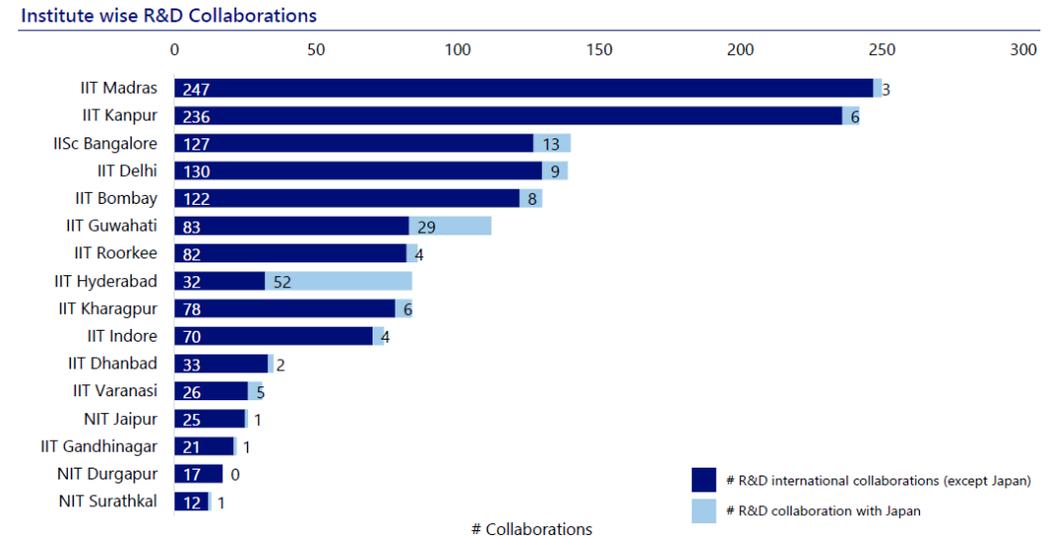
ISA and Gov. of Japan, JBIC, JICA and NEDO signed MOC in May 2022.



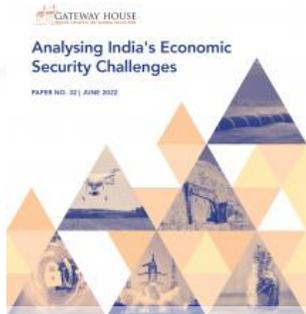
NEDO and ISA compiled a case study report concerning solar mini-grids in March 2022.

Collaboration with Indian Universities

NEDO's report on Joint R&D, supported by NRI



Collaboration in Economic security field



NEDO compiled this report in March 2022, with a support of Gateway House, an Indian think tank.



NEDO collaborates with ACSL India, JV of a Japanese leading drone maker and India's Aerodyne.



In August 2022, NEDO India held a webinar for discussing joint R&D between India and Japan. Eminent speakers there include Both Embassies, DST (Gov. of India), IIT Hyderabad, IIT Jammu.

NEDO India Webinar series (Launched in 2021)



(1) 4th of February 2021

Theme : India Electricity situation and Renewable energy

Speakers : CEA, SECI, Avaada, Toshiba JSW Power Systems Pvt.

(2) 10th of March 2021

Theme : Power distribution, Grid management
& Energy Distribution Management and Energy Storage

Speakers : NITI Aayog, POSOCO, Tata Power Delhi, Sumitomo Electric, etc.

(3) 24th of March 2021

Theme : Indo-Japanese Drone Ecosystem and Potential Collaborations

Speakers : MOCA, DFI, Gov. of Japan(Cabinet Secretariat, METI), ACSL

(4) 14th of January 2022

Theme : Carbon Neutrality in India

Speakers : NITI Aayog, MOP(BEE), CEEW, Reliance Industries, Mizuho Bank

(5) 15th of February 2022

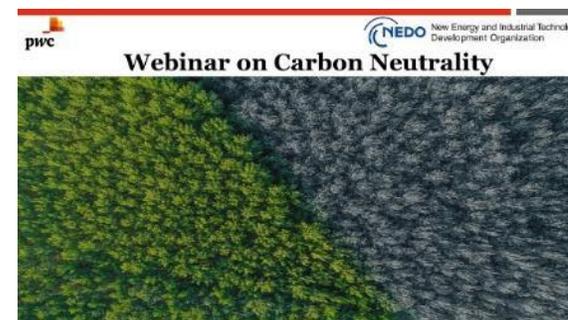
Theme : Mobility and Battery Storage

Speakers : CESL, ETO Motors, Ather Energy,
TDSG(TDS Lithium ion Battery Gujarat)

(6) 24th of February 2022

Theme : Biomass Energy

Speakers : MoPNG, PRESPL, IOCL, Hitachi Zosen



(7) 15th of March 2022

Theme : Solar Power and Mini Grid

Speakers : ISA, OMC Power, Gov. of Uttar Pradesh etc.

(8) 24th of March 2022 (Hybrid of Physical & Online)

Theme : Hydrogen

Speakers : NITI Aayog, MNRE, MoPNG(CHAT), Kerala State,
TERI, Gateway House, Emb.of Japan in India, JBIC etc.

(9) 30th of March 2022

Theme : Drones

Speakers : Tech-Sci Research

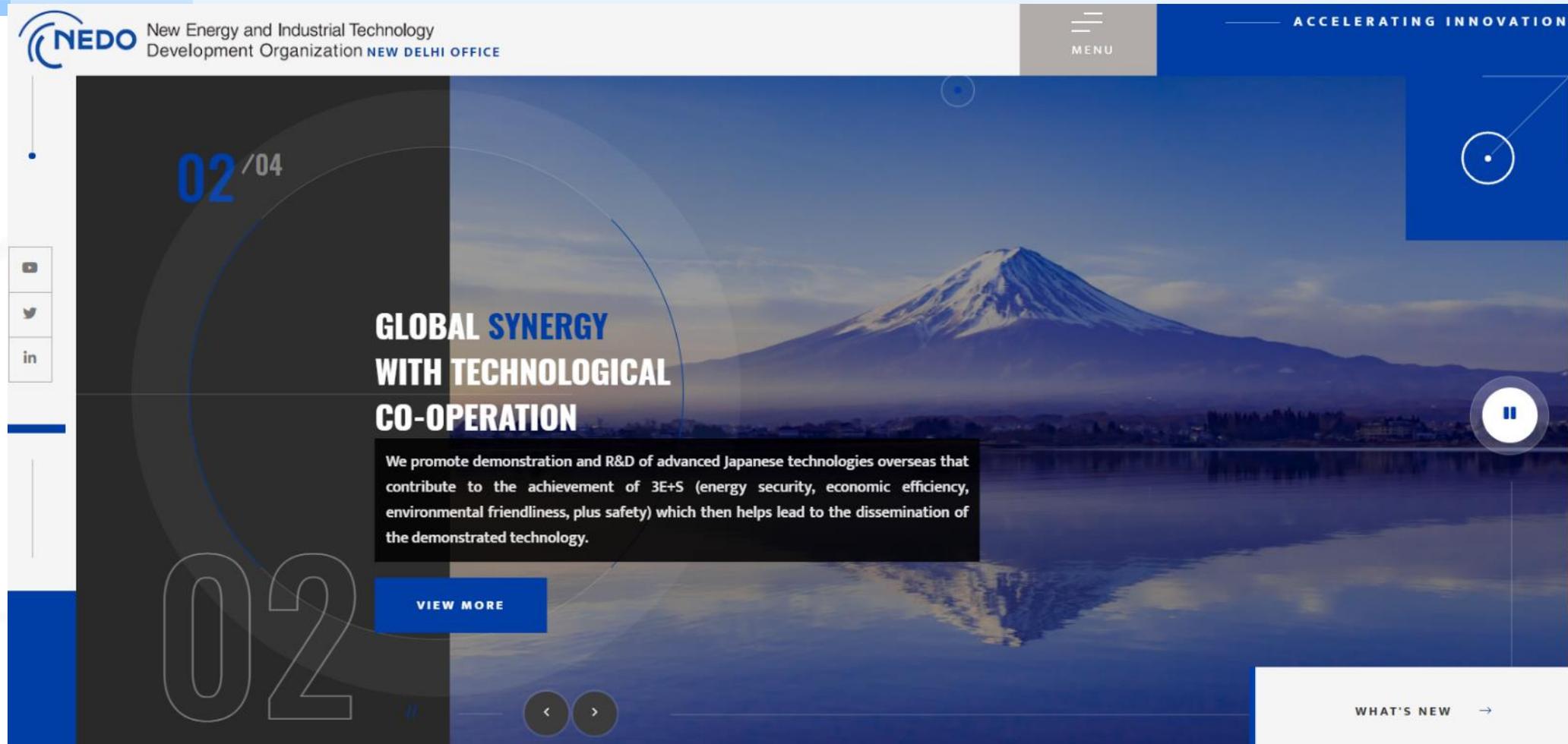
(10) 26th of August 2022

Theme : International Joint Research

Speakers : NRI India, DST, ISAJ, IITH, IITJ, Emb. of India in Japan
Emb. of Japan in India



Thank you for your attention!



NEDO India Website : <https://www.nedonewdelhi.in/>
Twitter : <https://twitter.com/NedoNewDelhi>
LinkedIn : <https://in.linkedin.com/in/nedo-new-delhi-92134021b>

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