French - Indian seminar on STI - Webinaire No1 (9 h – 11h)

1) **Denis Despréaux** (MESRI) recalls the previous seminars convened by AVRIST on the innovation ecosystems in Japan, China, etc…
   French- Indian scientific cooperation has been existing for years, particularly in the frame of a "Knowledge Summit". It could be strengthened in 3 areas : a) Entrepreneurship strategy : a better linkage between industry and academia, innovation clusters, technology parks ; b) fostering S&T in entrepreneurship : c) integrating grassroots innovation with a research ecosystem. All are under discussion in a joint meeting. France and India can learn a lot each other on industrial innovation since there is a real effervescence in India in this area

2) **Jérémie FORRAT-JAIME**, sous-directeur adjoint à la SD de l'Enseignement supérieur et de la recherche du MEAE, Deputy Head of the Higher Education and Research Department, French Ministry of Foreign and European Affairs**.** There is a joint committee "comix" for discussing priorities of cooperation between the two countries and setting up an agenda. Such a cooperation strongly benefits to diplomatic relationships – learning from each other – exchanging ideas and researchers – mobility for encouraging young talents – democracy – Better understanding what is India to day in terms of STI. Among several agreements under discussion, one of them addresses "qualification".

3) **INTRODUCTORY SESSION** - **Jean Luc Racine**, **coordinator** of this first session, is Emeritus Senior CNRS Fellow at the Center for South Asia Studies, Ecole des Hautes Etudes en Sciences Sociales (EHESS), Paris.

   In his general introduction, he describes the historical and ideological context of STI in India. STI is a key parameter of industrial autonomy. India has a long historical legacy in S&T development (medicine, pharmacopia, maths, astronomy, chemistry), Aryabhata was a famous astronomer in the 5th century. Then came the shock of European expansion. And the question of the teaching language (English). In 1857, Calcutta, Bombay and Madras universities were open. In 1930 Venkata Raman got the Nobel Prize in Physics before becoming the first Indian director of the Indian Institute of Science in Bangalore. ST was of utmost importance for Jawaharlal Nehru. It was under Nehru that the five first IITs were established as well as the opening of Atomic Energy commission and an Indian National Committee for Space Research. Rajiv Gandhi considered the importance of S&T to prepare India for the 21st century. The rise of private sector in information tech. 10 years ago the concept of "Indo–vation" was introduced

   Success of India in Space was at a remarkable low cost. What's happening right now under the Modi government? On the one hand we have an optimistic discourse ("Innovation Republic") but also a remittance of Hindu tradition. Specially facing the covid. In addition the question of "How to finance the S&T policy? " The R&D budget is now less that 1% of the total budget while it is > 2% in China. Undoubtedly India is trying to transform itself in a global manufacturing country. The slogan of the PM is now "Vocal for local; promote local products to make them global". The official language is to enhance development of traditional knowledge, and indigenous tech. Definitely, India is attractive to foreign industrial investment: last year Google invested 4 G$ for its platform, Amazon more than 2 G$, Goldman Sachs in biology, Tesla decided to set up an R&D lab, Total 2 G$. Regarding the Covid, India decided to authorize using its vaccines before a full completion of the tests

4) **Dr Joël Ruet (CNRS)** a specialist of sustainable energy and industrial dynamics in India and China. He taught at Jawaharlal Nehru University (JNU). His speech is dealing with **"Scientific and Industrial Challenges and Options for the Economic and Ecological Transition".** Policies and the Innovation Debate. What is at stake for India? Across the world, it is agreed that initiatives are much more bottom-

up than from a state push. But it's not quite true for India. Public programs are less than other parts of the world and less than in China. It requires that the actors know each other and work together. "Massification" is very important. India is an amazing laboratory because of the diversity of regions, of cultures, of its agriculture, and because it's amazing administration. How the two countries have to go beyond the stage of innovation? Indian IT companies become large and great because they "massified" on US market and European market. They did not "massif" so much in terms of services. Industrial Cies have managed to adapt to different situations across the country. It is what they call internal multinationals, because of the size of the country as a continent. This transition should be bottom up. Moreover the Government Science Policy should take in account India's S&T historical legacy and Hindu Nationalism. The dialectics are between India's global ambition and the renewed doctrine of self-reliance Options : circular economy. Localize agriculture. IA can help in the language problems.

5) **Pr Santosh Mehrotra,** visiting professor, University of Bath (UK), Pr of Economics and Chair, Labour Dpt, JNU : **"Can India become innovator of consequence ?"** .

STI success requires a national innovation system in many countries. India's STI had some success stories: Invention of the "zero"... And more recently the indigenous nuclear energy program; the hybrid seeds program (Green Revolution in Agriculture); the space program (satellites for telecom, meteo and the Mangalyaan Mission to Mars). However India in recent decades is more a consumer than a producer of knowledge

For improving the situation there are four challenges:

a) **Education**: multiple failures have led to poor educational outcomes for current workforce, leaving only 20 years before demographic dividend runs out. But the good news are that education and skills base has now been established. There is a shortage in STEM teachers at high level, a much greater investment in education is needed: 4% of GDP is not enough.

b) for the last 30 years, there was no real **industrial policy**; which has prevented India to become a manufacturing hub: innovation has stunted. Industrial policy before 1980 did not utilized India's most abundant factor of production: labour. After 1991 the opening economy policy of Government of India (delicensing, etc…) failed to obtain a significant manufacturing growth. India should learn more from Korea and Taiwan where investment in public research and number of scientific publications have grown up ; an industrial sector competing with best firms is a requirement for sustaining investment in in-house R&D. India needs creating a design and innovation institutional system; industrial policy needs a design ecosystem where design labs work to design quality products, carry out digitization, connect electronic systems, innovate for automation, all needed if India develops "Indy 4.0 tech "

Use India's Market size as an incentive to force design indigenization at FDI contract negotiation stage

c) India owns an **underfunded R&D system**, overly dependent upon publicly funded R&D: no way to convert patents into commercially viable technological solutions and goods. India spends only 0.82 %. But there is an impressive growth in scientific publications (ranking 5th in the world), patents (12 th) Public spending in R&D comes almost entirely from the Central government

Universities are neglected: publicly funded research concentrates in specialized institutes; universities have only a teaching role.

d) the **private corporate sector is under invested in both Design Capacity and R&D**. There are only 26 Indian Companies in list of top 2,500 global R&D spenders (301 for China); including 19 in only 3 sectors: pharmacy, automotive, software

Recommendations : way forward to enhance corporate R&D - India needs a National Innovation System (NIS), with higher R&D investment, more money from private corporate; GOI must spend more through Universities; and sets up a real examination of R&D from transnational perspective, not providing support to technology parks, incubators, startups, without NIS systems thinking

6) **Isabelle Joumard**, Head of Division, Economics Department at the OECD " **India's participation in the Global Economy – Opportunities and Challenges"**

Three aspects: a) **Migration** – is it a brain drain or a brain gain? India has the largest diaspora in the world (18 M), which promotes income and investment in this country (remittances amounted to 2.9% GDP in fiscal year 2018-19); many Indians study abroad (0.8 M). Migration can become a brain gain when research projects and innovation are shared with the home country. The research and innovation system reacts swiftly, with rich international scientific co-operation: India is ranking 4th in the number of publications concerning the Covid 19 : from January to November 2020, India co-authored 3655 documents, 86% of which were domestic authorship, the other involved international collaboration (mainly with USA and UK, Saudi Arabia, China, Thailand).

b) FDI = **Foreign direct Investment**: could it contribute to innovation and its diffusion? Inward FDI in India slowly increased from 2000 to 2019 (from 1.6% of GDP on average over the period 2000-13 to 1.8% for the period 2014_19, while it decreased in China). It could even increase further, if regulations become less restrictive.

c) **Trade**: are trade patterns conducive to innovation? Trade openness has increased with a tilt for services. The trend is to export products with more and more high skills and technology (35% instead of 25% in 2000). What does India export to day? ICT (Information and Communication Tech) 27% instead of 9% in 1997, medical products, diamonds, food products, etc… Average customs tariffs on imports have been cut but remain high (about 6%, China: 4%). India should avoid increasing trade barriers to get the most of its potential.

7) **Dr Anita Gupta**, Head National S&T Entrepreneurship Development Board (NSTEDB) – Dpt of S&T- Govt of India (GOI): **"Leveraging STI for a New Self Reliant India " –** Indian innovation ecosystem : India is in the list of top 50 innovative countries. It is ranked 63 among 190 economies in the ease of doing business. Indian STI ecosystem is an interesting case study

What are the government contributions? India is in contrast with most developed and emerging economies by a 60% involvement of the government in R&D. In the framework of an ambitious program called "Startup India & Stand up India". This initiative led to a significant increase in the quality and the extent of support provided by various departments of the central and state governments. Many ministries and Departments of the GOI contribute actively to upgrade the innovation ecosystem. Among all the central government Agencies, my Department of S&T (DST) has been the apex of the R&D contributors of the country. In 2016, DST launched a new program: "National Initiative for Developing and Harnessing Innovation" (NIDHI) as an umbrella program for building an innovation-driven entrepreneurial ecosystem in India. It is well known that most of the innovative ventures face enormous challenges in the early stages of development, DST has made endeavors for overcoming the famous "death valley" of innovation. It is expected that the number of startups in India will exceed 100.000 in 2025, creating more than 3 million jobs. So the total funding will increase to 150 G$ with a total value of 500 G$. This makes India the third largest country in the world for the number of startups. Regarding the Covid 19, DST started the new CAWACH program leading to the birth of 51 startups and market ready solutions. Dr. Mrs Gupta concluded as follows: "We as a Nation, have been very good at inventions and producing knowledge. Now it's time to translate this knowledge into commercially viable startups with speed and scale"

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