Dr. Bindu Dey is Secretary, Technology Development Board, Department of Science and Technology, Government of India. At TDB, her work profile includes funding companies aiming to upscale, manufacture and commercialize indigenous R & D leads and imported technologies for wider domestic use.

Dr. Dey has been deeply involved with leading institutions in human clinical trials; and has more than 20 publications on Drug; Vaccines and Immunomodulation trials. She has played a crucial role in catalyzing the development of infrastructure in the Bio-medical Institutions & Medical Colleges of the North-East Region for research, training & patient's services and starting major programs on Cancer Immunology and Biomarker Discovery in the state of J & K. On personal front, she is the co-founder of "Chandrabimb Foundation" wherein vision is " From Therapeutics to Prevention".

TECHNOLOGY DEVELOPMENT BOARD: MARCHING TOWARDS SELF-RELIANCE

Q; Can you comment on the genesis of Technology Development Board?

A: Technology Development Board (TDB) carries with it an interesting financial legacy. In 1986, the Government of India decided to levy a tax called R&D Cess on import of technology when technology-denial to India was rampant in most sectors; and Indian business community was generally technology averse. The R&D Cess was instituted through an Act of Parliament, known as the Research & Development Cess Act, 1986. It enacted collection of a cess at a rate of 5% on import of technology. The purpose of cess was to utilize the funds collected for development of indigenous technologies; and adaptation of imported technologies for domestic use. The proceeds of the cess like other cesses were credited to the Consolidated Fund of India (CFI), from where through the Parliament, these were initially paid to the Industrial Development Bank of India (IDBI) for Venture Capital activities. After about ten years of its operations with the IDBI, the Government realized limitations of IDBI to act as technology promoter at the national scale. Hence, through the intervention of the M/o Finance, the Technology Development Board Act was enacted in 1995 leading to conceptualization and establishment of TDB.

TDB was born on September 1, 1996 as a techno-financial institution with a mandate to use the R&D Cess funds for technology-based entrepreneurship development so as to maximize the commercialization of domestic technologies; and adaptation of foreign technologies by the local companies for commercialization. With this background, TDB always looked forward to products as the final outcome of its financing using R&D Cess.

Q: In your opinion, what are salient features of TDB Funding?

A: TDB has many USPs that place it on a pedestal different from other funding agencies, including the banks. To make special mention of:

1. It primarily funds companies, that too those who are working on technology-based projects;
2. It looks into technology newness, innovation, inventiveness or other such features in a project;
3. It is a techno-financial institution which is sector agnostic; Table 1 given below would give you an idea of how many sectors have been covered and how much funds provided over the years;
4. TDB takes risks, risk on project based on technology/R&D, unlike banks, who are generally averse to taking such risk; despite that, the success rate of TDB projects is about 67%;
5. TDB has expanded its risk by investing in Venture Capital funds much before any other allied agency could even think of that; again in Table 2, you may see the extent and Funds on which TDB has invested; and now slowly getting premium on such investments;

6. In recent years, specially in last three years, TDB officials alongwith domain experts provide mentorship, in shaping the project both financially & technically; they move alongwith the project and
7. TDB is a very small organization with majority of its funding going into project financing with about 5-7% into administrative expenses; yet it has become effective in project processing turn-over time and response to the applicants.

Q: Would you able to highlight changes that have taken place in last four years or so?

A: As the first statutory body within the government framework aligned to the Department of Science & Technology, Govt. of India, TDB provides financing of technology-based projects and providing financial assistance to industrial concerns and other such bodies through equity participation upto 25% of the project cost; soft loan @ 5% simple interest meeting upto 50% of the project cost; and sometimes grant.

In the last 21-years of its existence, TDB has signed more than three hundred agreements directly or in partnership with other loaning agencies including companies themselves. It has emerged as the oldest promoter of first generation technopreneurs and proved to be a game changer in many crucial sectors from time to time such as Pharmaceuticals & Biotechnology, Chemicals, IT, Electric Mobility, Medical Devices, Agriculture, Energy & Waste utilization and gradually making inroads into Defence, Cyber Security, Infrastructure and Textile technologies. I would like you look at the information provided below to come to terms with TDB's perpetual growth, insight and risk-sharing capabilities with Indian companies.

Table 1: TDB's Updated Investment Portfolio till 31.3.2018

TDB usually finances last leg of Product Development Cycle that comes post proof-of-concept stage has the advantage of better success rate despite high risk in terms of its investments as almost 70% of the companies have successfully commercialized their products and repaid the loans.

(Rs. in Crore)

S.No.	Sector	Number of Agreement's	Total cost	TDB's Commitment
1	Health & Medical	91	1884.96	552.09
2	Engineering	67	681.23	247.64
3	Information Technology	42	374.07	146.01
4	Chemical	25	222.16	78.33
5	Agriculture	25	203.78	64.44
6	Tele-communications	12	99.88	37.85
7	Road Transport	11	545.35	89.4
8	Energy & Waste Utilization	8	132.36	55.98
9	Electronics	4	52.56	17.75
10	Air Transport	1	131.38	64.9
11	Defence and Civil Aviation	9	517.45	165.05
12	Textile	1	689.00	250.00
13	Others			
	a) Venture Funds	11	2463.00	285.00
	b) STEP-TBI	35	35.00	35.00
	c) CII	1	0.83	0.50
	d) Millennium Alliance	1	112.00	25.00
	e) Global Innovation & Technology Alliance	1	15.00	7.35
	f) INVENT Programme	1	-	-
	TOTAL	**346**	**8160.01**	**2122.29**

TDB INTO GREATER RISK FUNDING: VENTURE CAPITAL FUNDING (VCF)

An interesting feature of TDB funding mechanism is its shift to providing soft loan rather than participation through the equity channel. It reflects risk-averse approach of the Board over the years that failed to supplement its investments through equity with robust exit policies. Despite those limitations, it has taken big risk on Venture funding along with other private & public equity institutions. While India's Venture Capital investments, both public and private have shown rapid development in the past few years, both locally & globally, this industry is still at a nascent stage. There is a trajectory emerging based on growth story driven by few innovative start-ups and talented entrepreneurs, the fact is that only a handful could promote innovation-based enterprises and helped conversion of scientific technology/knowledge-based ideas into commercial benefits.

TDB started percolating into VCF space to support early stage ventures having innovation and innovative products/services much before other government departments. It endeavors to identify differential needs of technology-oriented projects when faced with traditional requirements of the financial institutions and commercial banks, hence, deciding to participate in venture funding along with financial institutions taking greater risk. The Board approved its first VC investment in 1999 after which it participated in eleven funds as Limited Liability Partner in quick succession parallely framing guidelines. TDB made an investment of Rs. 285 cr. leveraging total funds aggregating to Rs. 2463 cr. from other investors as depicted in Table.

Table 2: Venture Fund Investments of TDB

(Rs. in Crore)

S. No.	Fund Name	Fund size	TDB Commitment
1.	UTI-India Venture Unit Scheme (ITVUS)	103.00	25.00
2.	The Biotechnology Venture Fund	100.00	30.00
3.	UTI-Ascent India Fund-II	300.00	75.00
4.	Ventureast TeNet Fund II	60.00	15.00
5.	SME Technology Venture Fund	250.00	15.00
6.	SME Tech Fund RVCF-II	150.00	15.00
7.	Indian Fund For Sustainable Energy	75.00	10.00
8.	India Opportunities Fund	1000.00	25.00
9.	SEAF India Agribusiness Fund	125.00	25.00
10.	Multi Sector Seed Capital Fund	100.00	25.00
11	Ivy Cap Ventures Trust- Fund 1	200.00	25.00
		2463.00	285.00

TDB EXPANDING ITS HORIZONS: FUNDING AND SECTORS

TDB has been expanding its footprints over the last couple of years. With an average of 5-6 projects per annum and a budget of Rs 30 crore/annum, it has reached to the level of Rs. 250 core of investments. In a Vision document prepared about 15 years back, the Board was asked to join hands with State Governments and many public sector undertaking to scout for technologies ready for up-scaling and useful for adoption. A cluster-like approach was also visualized. However, through repeated "Call for Proposals" in core sectors, there has been focus in many areas and TDB has been able to invest larger amounts of funds in core manufacturing sectors such as Defence, Vaccines, Roads & Textiles. The list provided below are indicative of how different portfolios have been addressed inviting almost three times the investments through co-funding. In fact, the initial investment by TDB provides comfort to the banking and other financial institutions for co-investments as each project is examined in a transparent and in-depth manner with the help of domain experts.

TDB has taken bold decisions during last two financial years to step into technology based for major funding of up to Rs. 250 crores. The philosophy for each of these is very clear.

List of agreements signed in 2016-17

(Rs. in crore)

S. No.	Project	Company	Total Project Cost	TDB's Assistance
1.	Indigenized development and commercialization of key components such as Motor, Charger, Controller, DC-DC Converter for Electric Vehicles	M/s Ampere Vehicles Pvt. Ltd, Coimbatore	6.91	2.43
2.	Commercialization and Setting up of Manufacturing Line for Indigenous Medical LINAC	M/s Panacea Medical Technologies Pvt. Ltd., Bangalore	19.30	7.40
3.	Commercialization of Fiber Laser Systems	M/s Sahajanand Laser Technology Ltd., Gandhinagar	24.53	6.40
4.	Specialized Digital Audio Hardware Solution for Residential and Professional Audio Segments	M/s Sonodyne Technologies Pvt. Ltd., Kolkata	16.24	5.00
5.	Manufacturing Facility for Pneumococcal Conjugate Vaccine	M/s Biological E Ltd., Hyderabad	320.39	100.00
6.	Development and Commercialization of Foot-and-Mouth Disease (FMD) Vaccine for Veterinary Use	M/s Sanvita Biotechnologies Pvt. Ltd. Hyderabad	101.18	16.00
7.	Setting up of Defence Manufacturing Facility at 50 acres Land at Vemagal Industrial Area, Kolar District, Karnataka	M/s Tata Power Company Limited, Strategic Engineering Division (Tata Power- SED), Bangalore	385.00	109.00
8.	Development and commercialization of Rule Buddy products (erstwhile "Arcita")	M/s SofTech Engineers Pvt. Ltd., Pune	6.15	2.45
9.	Commercialization of High speed serial link products	M/s Terminus Circuits Pvt. Ltd., Bangalore	20.79	9.70
10.	Development of an affordable connected Hemodialysis Machine for Rural Public Health Centers	M/s Renalyx Health Systems Pvt. Ltd., Bangalore	11.99	4.00
11.	Changing Energy Habits	M/s Energos Technologies Pvt. Ltd., Mumbai	6.55	2.25
12.	Development and Commercialization of Portable X-ray machine	M/s Iatome Electric India Pvt. Ltd., Coimbatore	5.36	2.04
13.	Manufacture and Commercialization of Novel, Innovative, point of care, diagnostic tests for monitoring of Diabetes	M/s DiabetOmics Medical Pvt. Ltd., Hyderabad	25.77	5.00
14.	Design, Development & Manufacturing of Industrial Robots	M/s Systemantics India Pvt. Ltd., Bangalore	8.20	4.10
	Total		958.36	275.77

List of agreements signed in 2017-18

(Rs. in crore)

S. No.	Project Title	Company	Total Project Cost	TDB's Assistance
1	Integrate Manufacturing and USFDA Approval of Percutaneous Transluminal Coronary Angioplasty (PTCA) Balloon Catheter	M/s S3V Vascular Technologies, Bangalore	36.43	13.03
2	Defibrinated Sheep Blood	M/s Akshaya Agribiomed Pvt. Ltd., Hyderabad	4.40	1.90
3	Development and Commercialization of Ubimedique Acute Care System (UCMAS)	M/s Mobilexion Technologies Pvt. Ltd, Thiruvanthapuram	2.60	1.0
4	Late stage development including Phase II & III of the attenuated dengue vaccine	M/s Panacea Biotech Pvt Ltd, New Delhi	57.98	28.99
5	Development and Commercialization of Sintered Carbide Alloys Technology	M/s Imco Alloys Pvt. Ltd., Mumbai	3.67	1.84
6	Catheter Reprocessing System (C.R.S)	M/s Incredible Devices Pvt Ltd, Chandigarh	1.05	0.47
7	Commercialization of cow dung compost as a means of strain delivery by applying electromagnetic radiation emitted from radionuclide's-60Co : Alternative of synthetic NPK	M/s MSV Laboratories Pvt. Ltd, Medinapur, W.B.	15.81	6.31
8	Commercialization & Development of IMRT/IGRT based Treatment Planning System (TPS) for 6MV Medical LINAC	M/s Panacea Medical Technologies Pvt. Ltd., Bangalore	5.00	2.50

S. No.	Project Title	Company	Total Project Cost	TDB's Assistance
9	Scaling-up A Proprietary Room-Temperature Lead-Acid Battery Recycling Technology from a Pilot-Proof-of-Concept to A Pilot-Commercial Scale	M/s VerdeEn Chemicals Pvt. Ltd., Ghaziabad	12.42	4.50
10	Establishing Commercial Plant using Congealing Technology to produce Lutein and other Carotenoids	M/s OmniActive Health Technologies Ltd, Mumbai	33.00	14.00
11	Cold Mix Technology in Road Construction & Maintenance	M/s BitChem Asphalt Technologies Ltd, Guwahati	18.31	8.20
12	Manufacturing of 50 IRS units (critical component of Cochlear Implant system) for supplying to DEBEL, DRDO for clinical trials	M/s Shree Coratomic Ltd, Pithampur (M.P.)	1.69	0.70
13	Technology Adaption and Manufacturing of BS VI Quality Standard Piston	M/s Abilities India Pistons & Rings Ltd., Ghaziabad	16.83	8.41
14	Development and commercialization of Biogas and Bio-Enriched Organic Manure Plant utilizing only paddy straw	M/s Sampurn Agri Ventures Pvt. Ltd., Chandigarh	38.54	7.05
15	Development and commercialization of straw utilization technology: In-situ Accelerated and Sustainable Rice Straw Decomposition (ASRSD)	M/s Kan Biosys Pvt. Ltd., Pune	3.48	1.74
16	Birla Excel Solvent Spun Cellulosic Fibre Plant	M/s Grasim Industries Ltd., Nagda, MP	689.00	250.00
	Total		940.21	350.64

TDB SUPPORTS SOCIAL ENTREPRENEURSHIP

The spirit of TDB Act goes beyond permitting just company-based commercialization of technologies, as the Government has repeatedly desired S & T sector to contribute towards social development. The Hon'ble PM has re-coined the term R&D from "Research and Development" to "Research leading to Development". While it is generally debated whether TDB should enter the domain of social enterprises, yet the organization has funded many projects for commercialization that benefit the society. Following its efforts, TDB has also joined hands with like-minded institutions to remove social disparities in Healthcare; Education; Agriculture; Water & Sanitation; green energy etc. Programmes such as Millennium Alliance and INVENT have been able to impact thousands of people from the low income states.

INVENT Program

Technology Development Board (TDB), in association with the Department for International Development (DFID) India initiated the Innovative Ventures and Technologies for Development (INVENT) in 2014. With support of upto £5 million form DFID, the INVENT program has been spearheaded by Villgro Innovations Foundation (www.villgro.org), as the lead Incubator. INVENT program is a platform to support inclusive innovative solutions, both technological and business-oriented that have positive social and economic impact on deprived strata of the society. Innovation-led entrepreneurship has the potential to reduce the disparity in social status through novel solutions, scalability, sustainability and affordability. The program broadly aims to support up to hundreds of entrepreneurs by providing funding and capacity building to incubators, in the eight low-income states (LIS) – Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh and West Bengal.

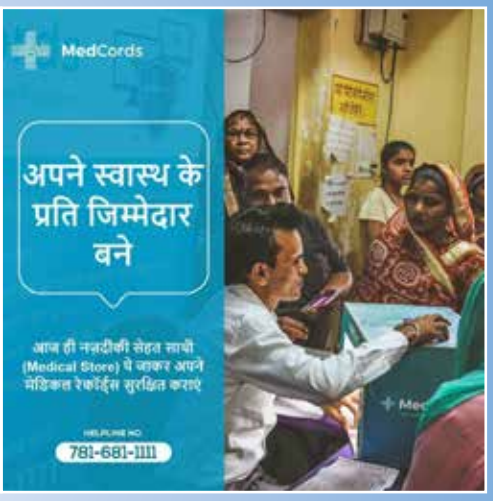
Currently, the INVENT Program provides technical and financial assistance to four select incubators viz, SIIC IIT Kanpur, KIIT TBI in Bhubaneshwar, IIMC Innovations Park at Kolkata and Startup Oasis in Jaipur. Through these incubators, the program specifically targets to support 160 entrepreneurs across the above listed 8 LIS and make 5 of them investible by 2019. Till date, while around 500 applications have been received from entrepreneurs under the INVENT Program, around 90 enterprises have been successfully incubated across the 4 incubators. Out of these, agri based start-ups occupy the largest share, followed by education, health and energy sector.

GLIMPSES FROM INVENT PROGRAM

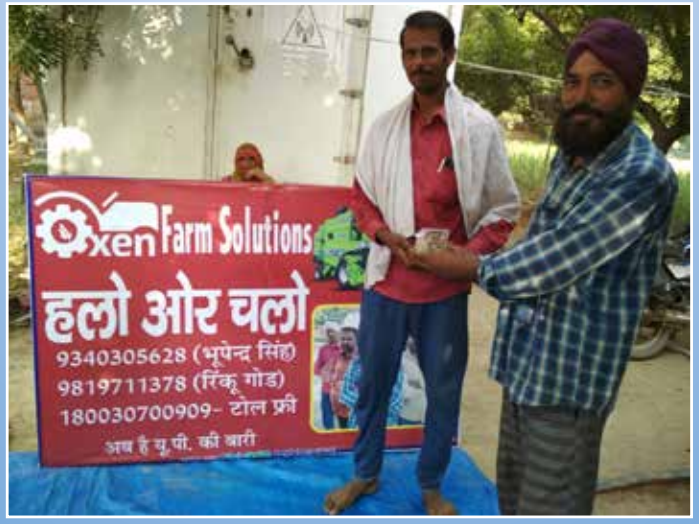
ApnaGodam: converts idle properties in rural areas into warehouses which could be used by Village Level Aggregators and farmers

Camel Charisma provides economic incentives for camel breeders

KrishiHub is building an agricultural ecosystem to solve farm related problems in India using technology, design and data science



Med Cords is a Tech platform to help patient to engage with doctors remotely via offline & online mode.



Oxen Farm Solutions addresses several challenge by providing services such as harvesting, straw management, sowing, spraying on a pay per use tech enabled model to the farmer.

MILLENNIUM ALLIANCE

Millennium Alliance (MA) is an inclusive platform to leverage Indian creativity, expertise, and resources to identify and scale innovative solutions being developed and tested in India to address development challenges that will benefit base of the pyramid populations across India and the world. The MA is a network to bring together various actors within India's social innovation ecosystem including, but not limited to, social innovators, philanthropy organizations, social venture capitalists, angel investors, donors, service providers, and corporate foundations, to stimulate and facilitate financial contributions from the private and public sectors and offer a range of support to innovators. Although MA considers supporting innovations across all development sectors, it prioritizes in basic education, water & sanitation, health, agriculture and clean energy. TDB, USAID, FICCI, DFID, ICCO, WORLD BANK GROUP and Facebook jointly support MA program, wherein, TDB has contributed Rs. 25 crore for a period of 5 years. The Alliance aims to provide innovators with services such as seed funding, grants, incubation and accelerator services, networking opportunities, business support services, knowledge exchange, and technical assistance, and will facilitate access to equity, debt, and other capital.

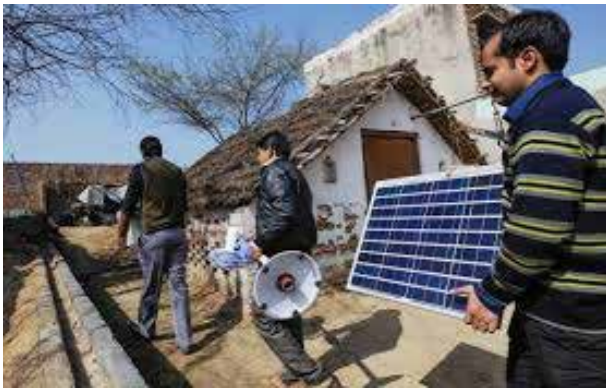
Contributing to social and economic development in over 20 Indian states and 11 countries, the program has so far supported 122 projects with a funding assistance of over Rs. 860 million. The program has directly benefited about 6.92 million people in India and over 36,000 people have been trained by the project awardees. Additionally, innovators have also been able to leverage their association with the MA to raise external funds worth Rs. 899 million, as well as develop 149 partnerships for extensive and sustainable project implementation.

MILLENNIUM ALLIANCE IN VARIOUS SECTORS

Agriculture

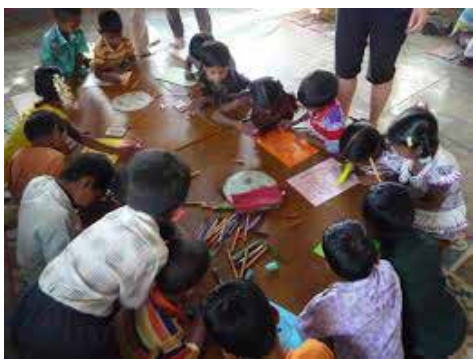
Agri SSI Kenya

Clean Energy



Simpa prepaid metered solar lights & fan

Education



Rishi valley multi grande methodology

Health

Forus 3-netra

Water & Sanitation

Swajal RO water

Financial Services

EKO mobile banking

TDB INTO PROJECTS OF NATIONAL RELEVANCE WITH BIG FUNDING: RATIONALE & ANALYTICS

A unique feature in TDB funding over last three years has been foraying into big funding to many big companies as well as getting into funding non-traditional projects as based on Road & Textiles technologies. The rationale behind this has been the risk taking capabilities of big companies in projects that are nationally relevant and more or less have bigger assured market in the form of Government, Global Vaccine players (GAVI) or large-scale import substitution. A few projects need special mention here.

PNEUMOCOCCAL CONJUGATE VACCINE BY M/S BIOLOGICAL E LTD., HYDERABAD:

Pneumococcal Conjugate Vaccine (PCV) is a preventive vaccine for childhood pneumonia, meningitis, ear infections and bacteremia Infection caused by Streptococcus pneumoniae. The World Health Organization estimates that S. pneumoniae the causative organism of pneumococcal infections, kills close to half a million children under five years of age worldwide every year, with most of these deaths occurring in developing countries. Although, PCV that protects against these diseases was first introduced in 2000, five of the highest burden countries—India, Indonesia, Chad, China, and Somalia—have not been using the vaccine in their routine immunization programmes. In August 2015, the Indian Government's National Technical Advisory Group on Immunization (NTAGI) made the historic decision to recommend that PCV be introduced into the Universal Immunization Program (UIP). Further, the Ministry of Health and Family Welfare, GoI with the support of Global Alliance for Vaccines and Immunization (GAVI) approved the introduction of PCV into five states through Mission Indradhanush.

Biological E Ltd. (BEL), which is already into the core business of anti-tetanus serum, TT and DTP Vaccines, embarked upon the journey to specialize in Low Cost Vaccines Manufacturing in 2008. They approached TDB in 2016 for their conjugate vaccine wherein polysaccharides from different etiologically important strains of S. pneumoniae been chemically coupled to a carrier protein (CRM197) that is known to trigger protective immune response in the vaccinated subjects. Each dose of the vaccine consists of several different polysaccharides conjugated to CRM197 in a liquid formulation. BEL has developed the product through an in house research and has filed two process patents for the vaccine composition and polysaccharide purification. BEL has redesigned the vaccine formulation to 14 valent, which offers broader protection than those available in the market with 13 and 10 valent conjugate vaccine. The vaccine composition is unique containing 14 serotypes of Streptococcus pneumoniae that have the highest propensity to cause respiratory disease in children. The company initially plans to produce around 25 million doses, which will be eventually scaled –up to 100 million doses annually. With the facility in India this superior product, including more number of serotypes can be provided to the mass at a reasonable price. This project has been approved by TDB for a loan assistance of Rs. 100.00 crores with a project cost of Rs 320.00 crores.

Shri Y. S. Chowdary, the then Hon'ble Minister of State for S&T and ES with TDB family

TDB FORAYS INTO DEVELOPMENT OF WORLD'S FIRST DENGUE VACCINE:

Dengue is a mosquito-borne flavivirus disease that has spread to most tropical and many subtropical areas. Caused by four closely related viruses, the Dengue viruses 1-4, there are no specific dengue therapeutics; hence prevention limited to vector control measures is the most adopted method. A dengue vaccine would therefore represent a major advance in the control of the disease. TDB entered into an agreement with Panacea Biotec Pvt Ltd. (PBL) for the late stage development including Phase II & III of the attenuated dengue vaccine in 2017. This is the first global dengue vaccine which is under most advance stage of development.

There are many dengue vaccines under development, including live attenuated virus vaccines, live chimeric virus vaccines, inactivated virus vaccines, live recombinant, DNA, and subunit vaccines. Scientists at National institutes of Health (NIH), USA developed the attenuated strains of Dengue viruses that were tested in non-human primates for their safety and immunogenicity properties through a technology transfer, took fully characterized Virus seeds of the four Dengue Vaccine candidate viruses from NIH USA. Working further on this, PBL developed in-house process to produce the vaccine virus Drug Substance (DS); analytical methods to qualify the vaccine; and lyophilized formulation for longer stability.

TDB has financially supported PBL for setting up of a project envisaging "Development and commercialization of Dengue Tetravalent Vaccine (Live Attenuated, Recombinant, Lyophilized)" as the country needs a preventive dengue vaccine urgently.

TDB INTO DEFENCE PRODUCTS:

TDB has a history of supporting small & medium scale companies who are creating an ecosystem of "Defence Products" in the country. 95% of India's defence products are imported. The current Government opened up vistas for MSME in creating pipeline of products. In TDB product portfolio, there are a number of companies who have commercialized their products:

Name of the company	Objectives
M/s Mak Controls and Systems (P) Ltd., Coimbatore	Development and commercialization of cargo loaders, air conditioning units and auxiliary power units for defence
M/s Aurora Integrated Systems Pvt. Ltd., Bangalore	Development & commercialization of Unmanned Aerial vehicles
M/s Zen Technologies Ltd, Hyderabad	Development & commercialization of Zen Driving Training Simulator (Zen DTS)
	Development and commercialization of unmanned Aerial vehicle mission simulator to be used for training purposes for Defence and BSF and Police Forces
M/s VEM Technologies Pvt. Ltd., Hyderabad	Development & commercialization of RF Seekers
M/s Primodia Chemicals and Pharmaceuticals (P) Ltd., Hyderabad	Production/manufacture of Primacene ® (registered brand name for the product, 4-(dimethylsilyl) butylferocene) grafted in a polymeric binder HTPB polymer
M/s Uurmi Systems Pvt. Ltd., Hyderabad	Development and commercialization of Software Defined Radio for defence purposes
The Tata Power Company Ltd-SED, Bangalore	Manufacturing Facility for defence products i.e. Telecom; Strategic Electronic; Avionics; Opto-Electronics & Power suppliers prototyped by DRDO

To move into the next step, wherein TDB funded companies not just remain as product pipeline but major supplier of Indian defence demands, TDB signed a loan agreement with M/s TATA Power

Company Ltd.-Strategic Engineering Division (TATA Power SED), Bangalore in 2016 for a project titled "Setting up a Defence manufacturing Facility at 50 acres Land at Vemagal Industrial Area, Kolar District, Karnataka". Here, TATA Power SED is aiming in setting-up a defence manufacturing facility at Vemagal for development of products in strategic defence areas such as telecom products, strategic electronics, avionics, opto-electronics and power supplies for ESDM Products. The facility will be used for manufacturing and integration of high volumes and large systems for various ongoing and upcoming programmes such as IEWS-MT, TCS, BMS, Rocket and Missile Launchers e.g. Pinaka, Akash, MRSAM etc. TATA Power SED have core competency in system engineering capabilities for Indian defence. They have provided turnkey solutions in the areas of air defence, electronic warfare, command & control system. They have been identified as a capable developing agency for two large Make Programme of the Ministry of Defence (MoD) viz. Tactical Communication System (TCS) and Battle Field Management System (BMS). TDB realized that to enter such areas of large demands with built-in risks, big companies may be more suitable. Hence, it decided to fund by providing the soft loan of Rs.109 crores in a Rs. 385.00 crores project.

TDB INTO UNIQUE GLOBAL TEXTILES TECHNOLOGY:

After a long debate within the Board, TDB signed an agreement with M/s Grasim Industries Limited, Mumbai for setting up the first commercial line for production of Solvent Spun 3rd Generation Cellulosic Fibre Lyocell, at Birla Cellulosic campus at Kharach, District Bharuch, Gujarat under the Brand name "Birla Excel". Birla Excel is manufactured by dissolving cellulose (pulp sheets) in an organic solvent (NMMO) to form a polymer solution, which is spun, through an air gap into an aqueous regeneration bath to form cellulose fibres. The solvent is recovered and recycled to the extent greater than 99.7% level in commercial plants. The Lyocell process/ Lyocell Technology is the most environment friendly & green process as compared to manufacturing process of other regenerated cellulose fibres, as there is no release of harmful gases, no use of harmful chemicals and very less usage of water. It also has better environment footprint than cotton due to its lower usage of water and land requirement.

The funded project is nationally an important endeavor and an ambitious effort of an Indian company, M/s Grasim to break into the monopoly of a single European company, Lenzing AG, Austria for producing Lyocell fibres through its branded product 'Tencel'. Lenzing, Austria is the sole supplier of this product in India. Hence, it is a major step for India to break the dominant hold in the Rayon Industry globally as well it will give a choice to the domestic textile industry to source this fibre domestically and also making pricing more efficient. Chinese Government has also put this technology in their priority list as it battles for market share in global market.

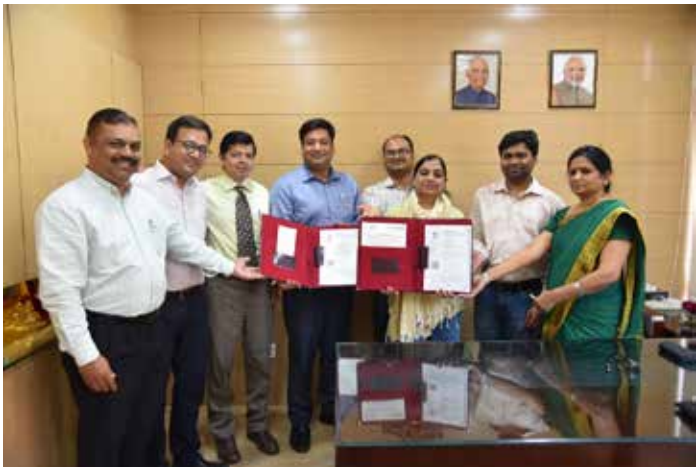
The company's R&D team continuously enhanced its lyocell process improving the design & engineering specifically in the areas of dope preparation, spinning & solvent recovery system. Rigorous R&D efforts were carried out for more than 15 years and they spent about Rs. 150 crores, before thinking of scaling-up with desired product quality and operation cost. TDB's assistance of Rs. 250 crores for this project has been the highest ever financial support sanctioned to a company with a total project cost of Rs. 688.00 crores.

TDB INTO GREEN ROAD BUILDING TECHNOLOGY:

TDB has taken a bold step of entering into the domain of infrastructure development by providing financial assistance to M/s BitChem Asphalt Technologies Limited, Guwahati, Assam for the project "Cold Mix Technology in Road Construction & Maintenance". BitChem promotes Green Roads® philosophy and encourages the usage of cold-paving technology in road construction and maintenance with benefits of reducing carbon emissions, eradicating occupational hazards to workers and engage in environment-friendly construction practices yet providing durable and lasting road surfaces. It entered into an "Licensee for Cold Mix Technology from CSIR-CRRI", the country's premier road research institute, based on credentials earned over the last 5 years in delivering the cold paving technology to the country.

BitChem tailor-made Cold Mix binders are

manufactured using special additives; and customized using specific aggregates available from any source in India i.e. high-fine aggregates, soil-coated aggregates, clean-aggregates and pea-gravel aggregates without pre-wetting. These binders are rich in anti-stripping properties, hence making cold-mix technology providing higher life to roads than conventional hot-mix technology. Cold Mix binders are complex products requiring high level of precision and quality control during manufacturing stage. Further, it requires precision control on the input of the various chemicals so that the emulsion behaviour is appropriate. In the first phase, the company envisages to establish manufacturing unit at Plasto Steel Park, Phase II, Barjora, Bankura, West Bengal.



Q; WHAT WOULD YOU SAY IN CONCLUSION?

A: In order to foster technological exchanges in the field of Science & Technology innovation, it is important to remain in touch with like-minded institutions. TDB has signed MoUs with various national and international institutions like TIFAC, ASSOCHAM, TIFAC, PHDCCI, CII, FICCI, Bpi-France, ICCo, and WWF-India, for furtherance of such endeavors in cohesive manner. Participation in VCF, INVENT and MA program are examples wherein TDB has taken its mandated activities far ahead in shortest span of time. Through such cumulative efforts, TDB has been able to spread technological innovations in the fields of education, livelihoods, sanitation, energy to even the remotest of locations. With growing partnerships, capacities and resources, TDB looks ahead to another fruitful year of many exciting milestones.

In conclusion, TDB would continue its path aiding to self-reliance of the country through promotion of commercialization of research leads, innovations and prototype technologies in all sectors relevant to national economy. In its journey to complement ongoing Government efforts towards the same, TDB would perpetually network and seek support of other players in creating appropriate ecosystem.

In the last 21-years of its existence, TDB has signed more than three hundred agreements directly or in partnership with other loaning agencies including companies themselves. It has emerged as the oldest promoter of first generation technopreneurs and proved to be a game changer in many crucial sectors from time to time such as Pharmaceuticals & Biotechnology, Chemicals, IT, Electric Mobility, Medical Devices, Agriculture, Energy & Waste utilization and gradually making inroads into Defence, Cyber Security, Infrastructure and Textile technologies. I would like you look at the information provided below to come to terms with TDB's perpetual growth, insight and risk-sharing capabilities with Indian companies.