
GOVERNMENT OF KARNATAKA
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KARNATAKA
BIOECONOMY
REPORT
2022
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KARNATAKA BIOECONOMY REPORT

2022

*This report has been prepared for **"Karnataka Innovation and Technology Society (KITS)"** under Department of Electronics, IT, BT and S&T, Government of Karnataka by Association of Biotechnology Led Enterprises (**ABLE**). The report is written by **Narayanan Suresh**, Chief Operating Officer of ABLE and **Srinivas Rao Chandan**, Editorial Consultant for ABLE*

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KARNATAKA REGISTERS OVER 21% GROWTH IN BIOECONOMY

DESPITE TWO WAVES OF COVID-19 AND LOCKDOWNS, IT WAS AN IMPORTANT YEAR FOR KARNATAKA'S BIOECONOMY. KARNATAKA'S BIOTECHNOLOGY INDUSTRY HAS BEEN AT THE FOREFRONT OF FIGHTING THE PANDEMIC BY DEVELOPING AND DEPLOYING A VARIETY OF ANTI-VIRALS, DIAGNOSTIC TESTS AND ADMINISTERING VACCINES.

HERE ARE SOME OF THE KEY HIGHLIGHTS OF WHAT HAS BEEN AN EXCEPTIONAL YEAR WHEN THE BIOECONOMY GREW FROM **$13.6 BILLION** IN **2020** TO **$16.4 BILLION** IN **2021**.

- Karnataka's BioEconomy records 21 percent growth in 2021 compared to 15% growth recorded nationally.
- On an average 8 Biotech start-ups were incorporated every month in 2021 (a total of 95 biotech start-ups were set up in 2021)
- Karnataka generated $45 million of BioEconomy daily or $1.37 billion per month
- Karnataka administered 104.8 million doses of Covid-19 vaccines. It means nearly 2.4 lakh doses of Covid-19 vaccines were administered per day or 7 million doses per month
- Karnataka conducted 65.5 million cumulative tests. In 2021 alone, Karnataka conducted 42.4 million tests. It means the state witnessed an average 1.16 lakh Covid-19 tests each day in 2021 or 3.5 million Tests per month
- Unprecedented R&D investments. Karnataka's Biotech industry crossed $180 million R&D Spend. Thanks to Covid Economy.
- Covid Economy alone generated $971 million BioEconomy
- Karnataka accounted for 20.4 percent share of India's BioEconomy of $80.12 billion in CY2021. Karnataka was the second largest state after Maharashtra which contributed 23 percent share
- Karnataka's share of contribution to the national BioEconomy jumped from 19.4% in 2020 to 20.4% share in 2022

Executive Summary

BIOECONOMY OF KARNATAKA

(including additional segments)

By measuring and comparing the BioEconomy with the same yardstick that was used to arrive at the national BioEconomy, Karnataka reported $16.4 Billion BioEconomy in calendar year 2021 (from January to December 2021).

Karnataka however has contribution in few other significant areas like digital healthcare and drug delivery; big data, IoT, and artificial intelligence driven platforms; smart agriculture and smart foods, veterinary science and re-agents and analytical businesses. These new segments are nearly $5.5 billion in value. Take for example smart agriculture or agritech. According to Nass-com, Karnataka and Maharashtra together have close to 50 percent of the agri-tech start-ups. In term of funding nearly two-thirds (67%) of the total funding received by start-ups has gone to Karnataka's start-ups.

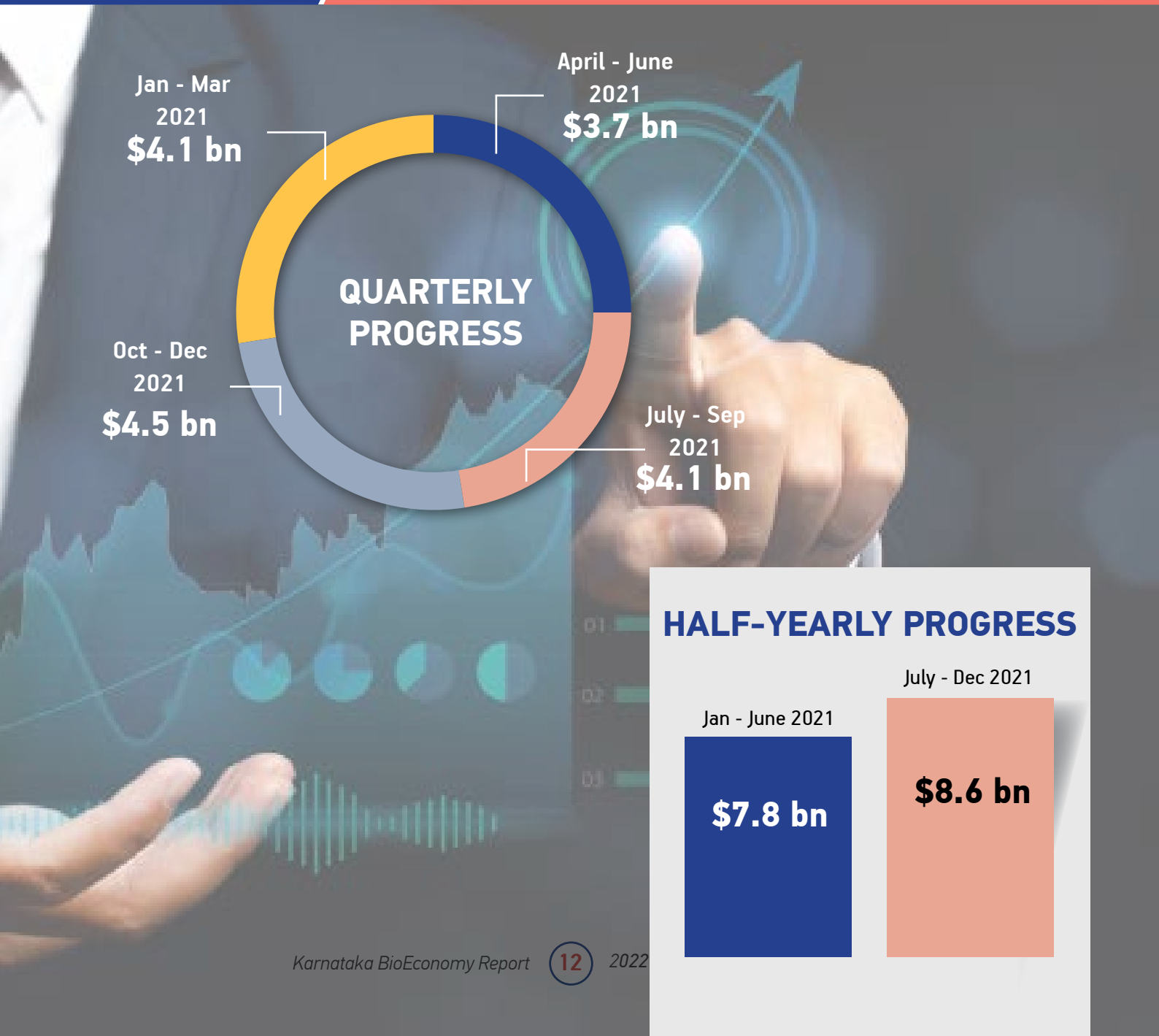
- BioEconomy (standardized): **$16.4 billion**
- Agritech, Marine, Animal, and dairy biotech: **$1.8 billion**
- Digital health, BioIT, BigData, "omics": **$5.65 billion**
- Biotech reagents and analytical instruments: **$1.1 billion**
- Other biotech research activities including in bioremediation, solid waste management, clean water, new drug/platform research, and clinical data management hubs: **$1.95 billion**

Total $26.95 billion

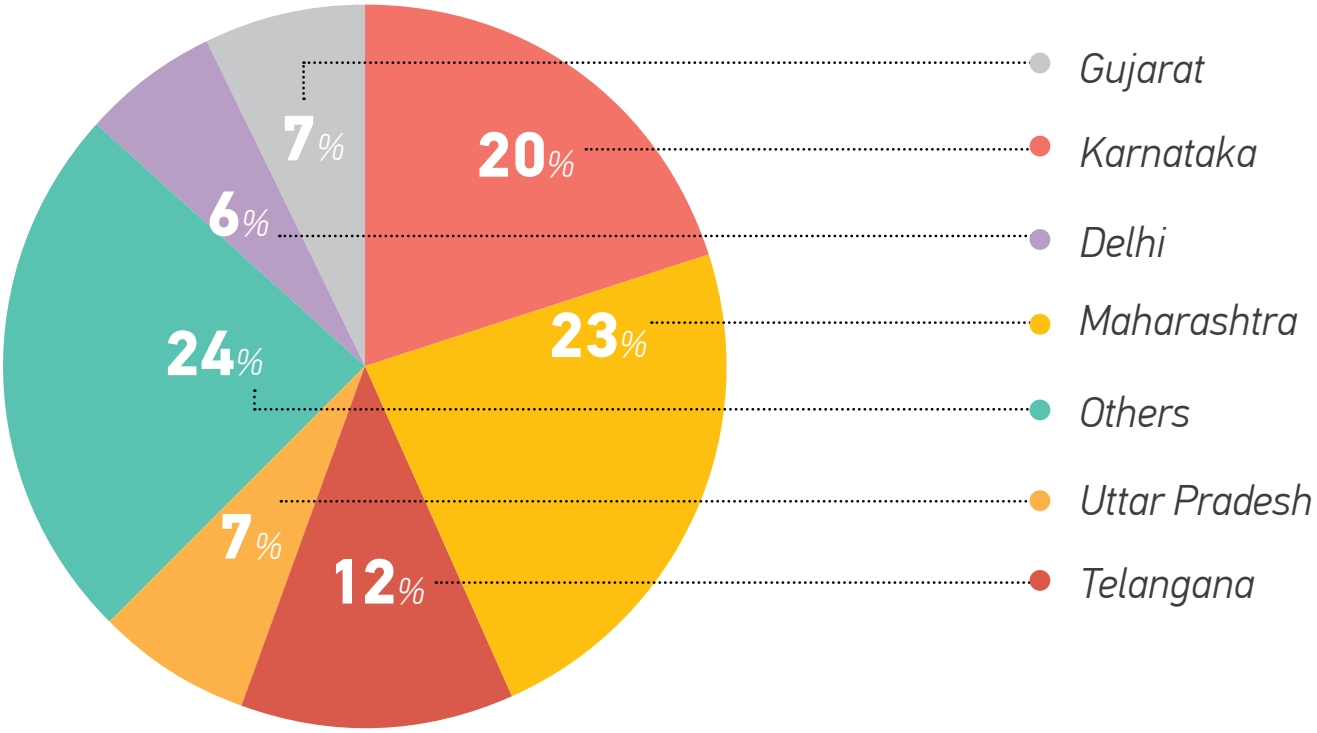
SEGMENT	BIOECONOMY 2020 ($ mn)	BIOECONOMY 2021 ($ mn)	Change over 2020 (%)
BioEconomy of Karnataka (Standard Calculation)			
BioAgri	717.6	793.9	11%
BioIndustrial	892.8	1985.9	122%
BioPharma (Therapeutics, Vaccines, Diagnostics, Medical Devices)	7670.7	9707.4	27%
BioServices (CRO / CDMO)	2488.2	2988	20%
Covid Economy	422.0	971.35	130%
Other Biotech	1418.0	--	
BioEconomy of Karnataka (Harmonized with national Economy)	***13609.3***	***16446.6***	***21%***
BioEconomy of Karnataka (Based on Additional Segments)			
Agritech, Animal, Marine, Dairy Biotech, Sericulture	1,700	1,800	6%
Digital Health, BioIT, BigData, "omics"	4,900	5,650	15%
Biotech Reagents and Analytical Instruments	950	1,100	16%
Other Biotech including research, bioremediation, clean water, environmental biotech, new drugs/ platform research, etc. Captive clinical data management centers, R&D services centers	900	1,950	117%
Total of Additional Specific Segments	*8450*	*10,500*	*24%*
TOTAL BIOECONOMY INCLUDING ADDITIONAL SEGMENTS	***22,059.3***	***26,946.6***	***22%***

HOW KARNATAKA GOT TO $16.4 BILLION IN 2021?

BioEconomy / *Quarterly and Half-Yearly Performance*



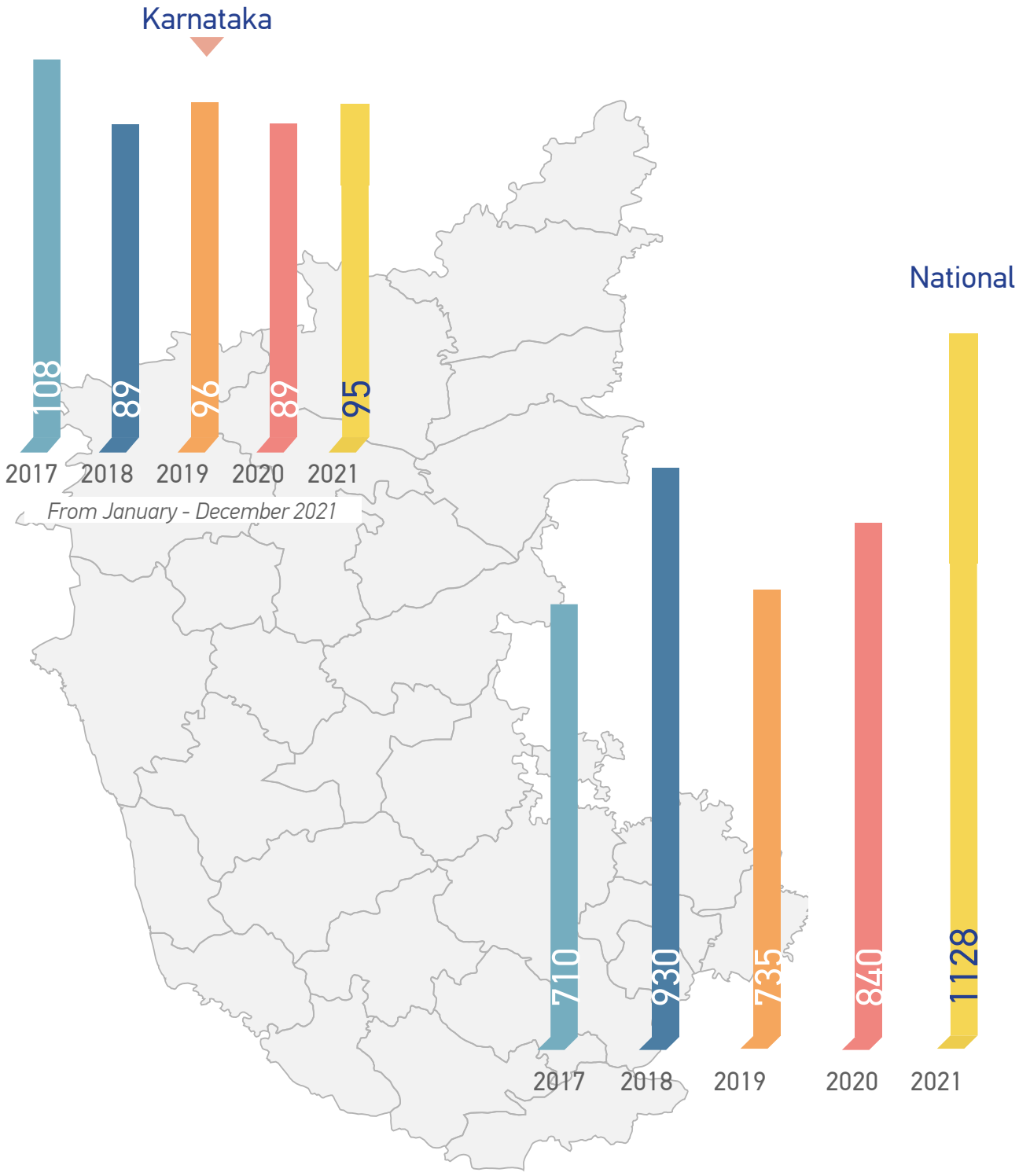
KARNATAKA'S SHARE OF INDIAN BIOECONOMY

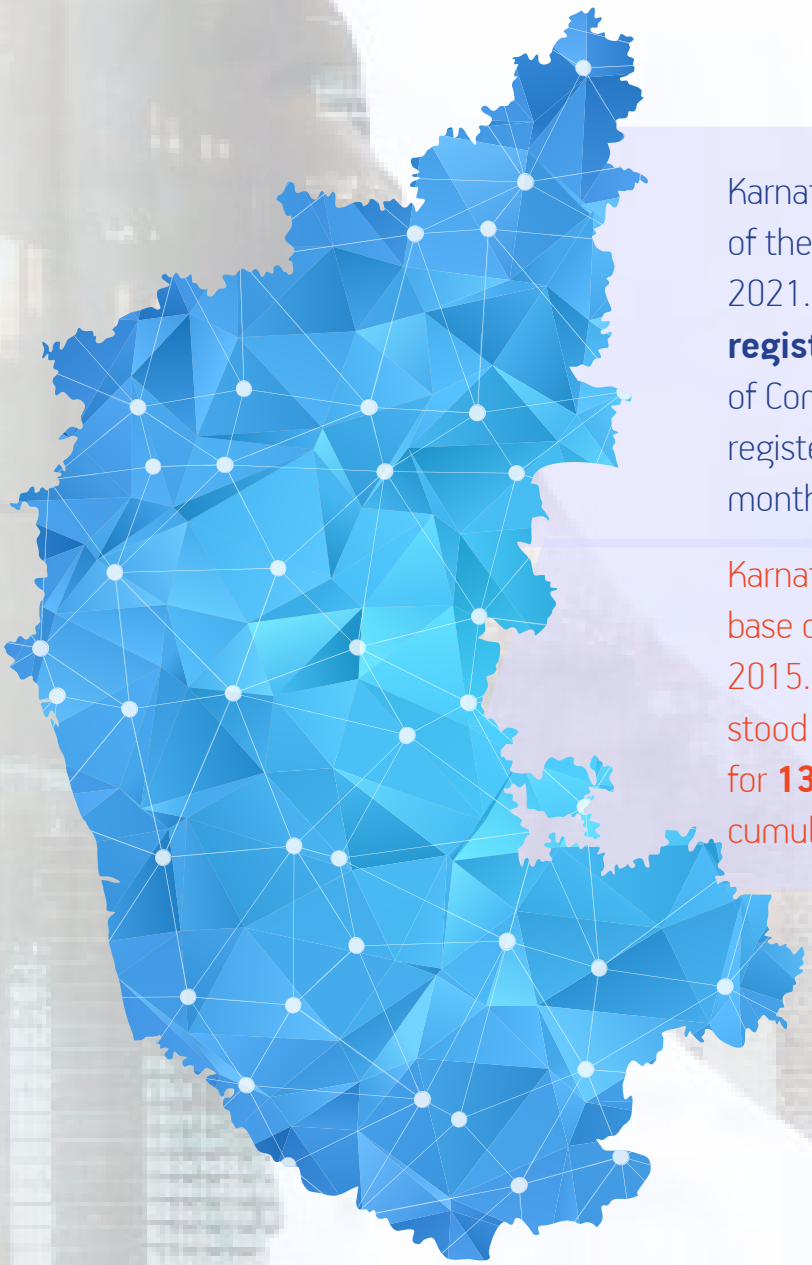


Leading Contributors to BioEconomy

State	BioEconomy 2021 ($ Billion)
Maharashtra	$18.6 Billion
Karnataka	$16.4 Billion
Telangana	$ 9.6 Billion
Uttar Pradesh	$ 6.0 Billion
Gujarat	$ 5.9 Billion
Delhi	$ 5.1 Billion
Other States	$19.1 Billion
All India	$80.7 Billion

START-UPS IN KARNATAKA



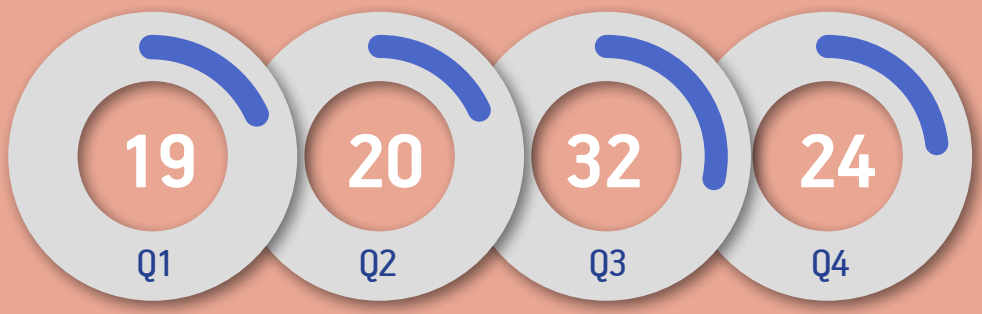


Karnataka accounted for **8.4 percent** share of the total number of start-ups registered in 2021. The state had **95 biotech start-ups registrations** as per the data of Registrar of Companies (RoC). The state continued to register about **eight biotech start-ups** every month.

Karnataka has the second largest cumulative base of start-ups set up in the country since 2015. The total cumulative base of start-ups stood at **697 companies**. The state accounted for **13 percent** share of the overall national cumulative base figure of **5,365**.

Quarter-wise, maximum number of registrations happened in July-September quarter. The quarter saw 32 registrations and accounted for 34 percent of all registrations in 2021.

Quarter-wise Registration of Start-ups in 2021



PROGRESS ON STRATEGIES FOR $50 BN BIOECONOMY

Establishment of **Vaccine** Hub

- Biovet at Malur, Kolar District, has been re-tooled with the support of Department of Biotechnology (DBT), Government of India, to produce Covaxin. Support under existing policies
- Government of Karnataka has commissioned ABLE to submit techno-commercial feasibility report for establishment of Vaccine Research and Pilot Production Facility

#1

Set up **BioManufacturing** Hub

- In collaboration with Department of Commerce and Industries, Pharma Park at Yadgir is promoted as BioManufacturing Hub.
- Land has been allotted to Shilpa Biologicals and other pharma companies

#2

Expansion of **BioAgri**

- Establishment of Farm Innovation Centre at Bengaluru Bioinnovation Centre (BBC) under the Rashtriya Krishi Vikas Yojna (RKVY) Scheme.
- K-tech Innovation Hub at CFTRI, Mysuru, to support development of value-add products.
- Support for development of disease-resistant varieties of agri-horticultural crops

#3

Increase **Marine Biotech** yield and production

- Focus will be to add $3 billion to existing $2 billion BioEconomy by adopting scientific inputs.
- Advance Biotech Innovation Centre for Aqua-Marine at a total cost of Rs 6 crore is proposed at Mangaluru in FY 2021-22

#4

Develop **BioMedical** Cluster

- Identifies BioMedical cluster for insulin pens, implants, and medical electronics.
- The state government has submitted a proposal to the Department of Pharmaceuticals, Government of India seeking support for a medical devices park in 200 acres area at Kochanahalli Industrial Area near Nanjanagud of Mysuru district

#5

Push **AgriTech** platforms

- Centre of Excellence for Agri Innovation established at the Centre for Cellular and Molecular Platforms (C-CAMP) to foster innovation and enterprise formation in agriculture.
- Agriculture Grand Challenges launched in July 2021. The goal is to support deep science innovation & target 4-5 world-class products at the end of the program period.
- Good coordination with Dept. of Agriculture to introduce novel technology, high yielding lines, and better management of practices to the farmers and establishment of demonstration plots.

#6

Integrated **Biorefineries** Cluster

- It is proposed to develop Hubballi-Dharwad-Belgaum as cluster for promoting the production of ethanol.

#7

Biomedical Cluster

The state government has sent a proposal to the Centre seeking assistance to establish a medical devices park at **Kochanahalli Industrial Area** near Nanjanagud of Mysuru district. The Union government's "**Promotion of Medical Devices Parks**" scheme provides one-time grant-in-aid of **Rs 100 crore per park**. This scheme calls for the creation of common infrastructure facilities in four selected parks, which are to be developed by the state governments.

Biomanufacturing Hub

The Pharma Park at Yadgir is being promoted as BioManufacturing Hub in collaboration with Department of Commerce and Industries. The state government has allotted land for seven projects of pharmaceutical companies that are investing **Rs. 123 crore** at Kadechur village in Yadgir district. These units are expected to create **633 jobs** for youths. The government also gave approval to **16 pharmaceutical and drugs industries** that are investing **Rs 962.5 crore** and will create **3,000 jobs**.

Pharma industry in Karnataka is benefiting from the Union government's productivity linked incentive (PLI) scheme and the state government's first-ever turnover-based incentive system. At least **45 companies** have confirmed their investment plans. These include Arouse Pharma, Astragen Labs, Bhagiradha Chemicals, Hari Pharma, Jet Lifescinces, Mabhika Organic Chem, Indur Lifesciences, Shilpa Medicare, Sirya Fine Chemicals, Sri Lakshmi Chemicals, Sri Monashi Lifesciences, Synthecis Pharma, and Vibrant Pharma Chem. The state is making significant inroads into newer areas and on path to be a **$50 billion** BioEconomy. The start-up ecosystem in Karnataka is doing well as well.

Agritech

The Centre for Cellular and Molecular Platforms (C-CAMP), India's premier bio-incubator and innovation hub has recently received support from Dept of IT & BT, Govt of Karnataka and the Ministry of Agriculture. This is to set up the K-TECH Centre of Excellence for Agri Innovation to foster innovation and enterprise formation in agriculture.

C-CAMP has been creating and fostering an entrepreneur-friendly culture in and around academic environment through various activities. C-CAMP has supported over **100 Life Science start-ups** and now aims to replicate the success in agricultural domain. The mandate of the Centre is to Identify gaps in agriculture through an Immersion program in different regions in the country; Attract innovators to address these identified gaps & challenges and develop solutions for these issues through a Grand Challenges Program; Support and nurture the innovators through incubation, funding and mentorship to bring their solutions to the market.

C-CAMP aims to identify and support at least **8-10 path-breaking innovation**s with national impact in the **agriculture** field and facilitate the validation and deployment of these innovations in the **next 5 years**.

KEY INITIATIVES

The state has taken a few interesting initiatives to make the $50 Billion BioEconomy target a reality by FY25. This is to create new opportunities for the industry to generate additional revenues of $8-10 billion. The state government understands that it has an important role to play in development of Karnataka's trade and investment led by the bio-based Economy.

In March 2020, the Union government introduced Production-Linked Incentive (PLI) Scheme. The scheme was to provide companies in specific sectors incentives on incremental sales from products manufactured in domestic units. This scheme invites foreign companies to set shop in India and also aims to encourage domestic companies to establish new facilities or expand existing manufacturing units. The scheme for the Pharma and Medical Devices came into effect from July 2020. The PLI scheme witnessed good traction and this is now being extended to 10 more sectors including Food and Textiles.

Karnataka fast-tracked investments following the Union government's schemes on production linked incentive (PLI) in biotechnology. The state stands third in the country in attracting foreign direct investment (FDI) after Maharashtra and Delhi and is the fourth largest tech cluster globally after the Silicon Valley, Boston and London.

Even in COVID-19, the state remained proactive to attract the required investments in biotech. The state put in place systems for ease of doing business by amending the Industry Facilitation Act where for at least 2-3 years, companies need not seek permission from the government and could start operations.

It also initiated reforms in land and labour and also announced the formation of an Innovation Authority which is a first of its kind in the world.

The industry is working with the government and the state has helped to ease some of the regulatory challenges. Karnataka is now working closely on developing vaccine, biomanufacturing, biorefining, medical devices and agri-tech hubs. The biotech incubators in the state have launched programs that are creating a market or market access for the biotech or medical device products. Nearly two dozen products were launched during the last 18 months.

Karnataka was on aggressive mode to attract potential Covid-19 manufacturers to set up production plants in the state. This was in synch with the Union government's efforts to encourage vaccine manufacturing in the country.

BioIndustrial

Covid Economy and BioIndustrial segments were the two major contributors to Karnataka's BioEconomy in 2021 with triple digit growth. While Covid-19 based BioEconomy grew by 130 percent, BioIndustrial saw phenomenal 122 percent rise. These two segments infused additional $1.6 billion in value and generated 9.75 percent value share.

Karnataka's Biofuel is home to over 50 ethanol producers that will make India achieve 20 percent blending by 2025. Karnataka is the third largest producer of biofuels and among the states which have reached 9 percent blending of petrol in 2021.

India's largest capacity syrup-based ethanol plant is being set up by Godavari Biorefineries (GBL) in Karnataka. It is expanding the existing ethanol manufacturing capacity to 600 kilo litre per day (KLPD), using sugarcane syrup. When commissioned, this will become India's largest capacity syrup-based ethanol plant.

Karnataka is third largest in ethanol installed capacity. Karnataka had 2620 KLPD installed capacity of ethanol manufacturing till 2021 procurement season.

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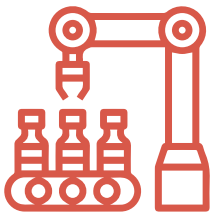
BioManufacturing

Hubballi-based **Shilpa Biologicals**, a wholly-owned subsidiary of Shilpa Medicare, committed to invest **Rs 150-200 crore** into its **Sputnik V** vaccine manufacturing facility. Shilpa Biologics had signed a deal with Dr Reddy's Laboratories to make **5 crore doses** of the Russian vaccine Sputnik V. Recently Shilpa Medicare signed a definitive agreement with **Cadila Healthcare** Ltd (CHL) for production-supply of the **ZyCov-D vaccine** drug substance from its integrated Biologics R&D cum manufacturing center at Dharwad, Karnataka.



Covid-19 led to Karnataka encouraging Vaccine Manufacturing and Vaccine Development.

Bharat Biotech has expanded production of **Covaxin** at its vaccine manufacturing unit at Malur Industrial Area in Kolar district. The company's unit in Malur, which is a subsidiary of Biovet and was engaged in the animal vaccine production of Foot and Mouth Disease (FMD) and brucellosis. The new unit will manufacture Covaxin supported by the Union government. The state government has approved the project and the company targeted manufacturing capacity was nearly **50 million** doses a month by end of 2021.

In March 2021, Bengaluru's **Stelis Biopharma**, the biopharmaceutical division of Strides, partnered with the Russian Direct Investment Fund (RDIF) to manufacture nearly **200 million doses** of the Russian Sputnik V vaccine. Stelis Biopharma raised $195 million in Series B and Series C rounds at a valuation of $350 million. It has built a greenfield vaccine plant with a 40,000 liters drug substance bioreactor capacity at a 2,000 liters scale, using Single-Use Bioreactor technology and is capable of producing 720 million doses in a year.

Biocon Biologics Limited (BBL), a subsidiary of Biocon Ltd. and **Serum Institute Life Sciences** Private Ltd (SILS), a subsidiary of Serum Institute of India Pvt. Ltd. announced a strategic alliance. Under the terms of the agreement, BBL will offer approximately 15% stake to SILS, at a post-money valuation of $4.9 billion, for which it will get committed access to a 100 million doses of vaccines per annum for 15 years with commercialization rights of the SILS vaccine portfolio (including COVID-19 vaccines) for global markets.

Laurus Bio expands its operations in Karnataka by acquiring **Richcore Life Sciences** and is expanding its manufacturing capability by building a second recombinant protein manufacturing facility at Tumkur and a bigger facility at Harihar at total investment of **₹400 Crore**.

Indigenization of Diagnostics & Medical Devices

Karnataka has a very important role in indigenization of Diagnostics products. The Indigenization of Diagnostics (InDx) platform was set up under guidance of the Principal Scientific Adviser to the Government of India at C-CAMP. It was to build large capacity of COVID-19 molecular diagnostic kits and reagents. The outcome of this program is that the nation was able to assemble 2 million indigenous diagnostic kits per day. Prices of the few of diagnostics were brought down to as low as $1 from $25.

Covid diagnosis using WhatsApp. An AI driven platform, XraySetu uses X-ray images sent via WhatsApp to help determine if a person is suffering from Covid-19. XraySetu is developed by Artpark, a not-for-profit foundation established by the Indian Institute of Science (IISc), Bengaluru, with support from the Department of Science & Technology (DST), Govt. of India, in collaboration with Bangalore based HealthTech start-up Niramai and the Indian Institute of Science (IISc). Portable Digital X-rays, Mobile Diagnostic testing labs for Covid-19 and many such new innovations started here.

Mysuru-based Skanray Technologies was one of the largest suppliers of ventilators. Over 30,000 of its own designed CV200 advanced ICU ventilators were added to the national stockpile through licensing agreement with Bharat Electronics Limited (BEL), taking the lead in the Prime Minister's clarion call for 'Atmanirbhar Bharat".

Mysuru-based Skanray Technologies designed over 30,000 of its own CV200 advanced ICU ventilators and were added to the national stockpile through licensing agreement with Bharat Electronics Limited (BEL), taking the lead in the Prime Minister's clarion call for 'Atmanirbhar Bharat".

Innovation Elevation

Karnataka has launched a unique International Acceleration Programme for biotech startups where experts from Silicon Valley are helping to take their bioinnovations to global stage.

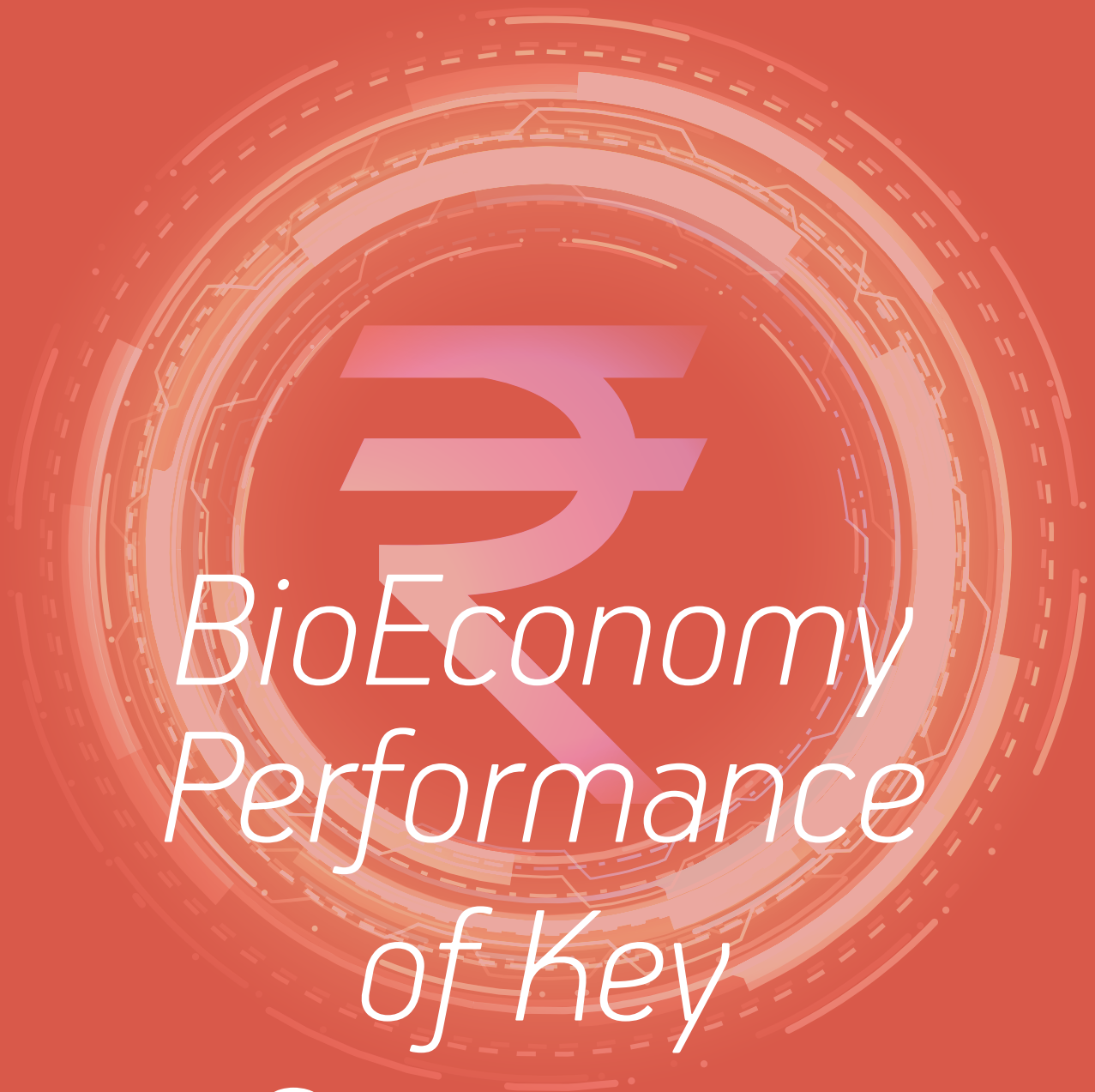
Unique Marine Biotechnology Incubator is established in Mangaluru to support innovative ideas and encourage growth of marine biotech sector in the State.

First of its kind Anti-venom R&D centre with Serpentarium will be established at Bengaluru Helix Biotechnology Park to develop offordable next generation anti-venoms.

Japanese major, Yokogawa Electric Corporation, announces expansion of their Indian operations into the Biotech and Life Sciences sectors with operations from Bangalore BioInnovation Center.

Perfect Day, Inc., considered to be creator of the world's first animal-free milk protein, announced a $350 million Series D funding to focus on biological engineering, ingredient innovation, and consumer products. It has strengthened operations in Bommasandra, Bengaluru

First of its kind Anti-venom R&D centre with Serpentarium will be established at Bengaluru Helix Biotechnology Park to develop offordable next generation anti-venoms

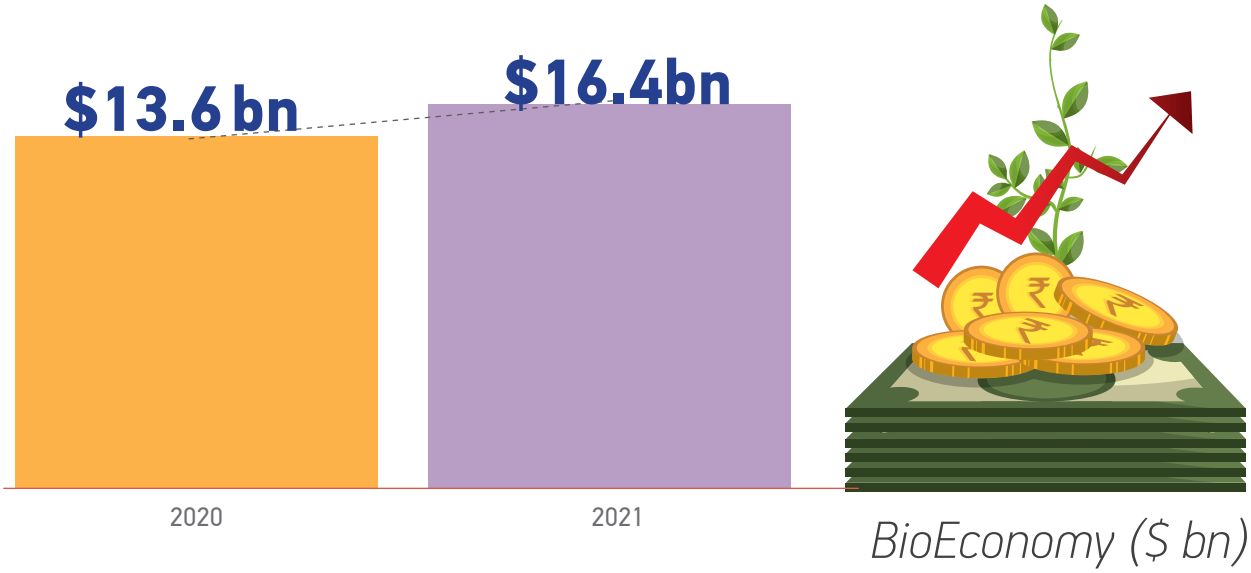


BioEconomy Performance of Key Segments

KARNATAKA REPORTED $16.4 BN BIOECONOMY IN CALENDAR YEAR 2021

(FROM JANUARY TO DECEMBER 2021)

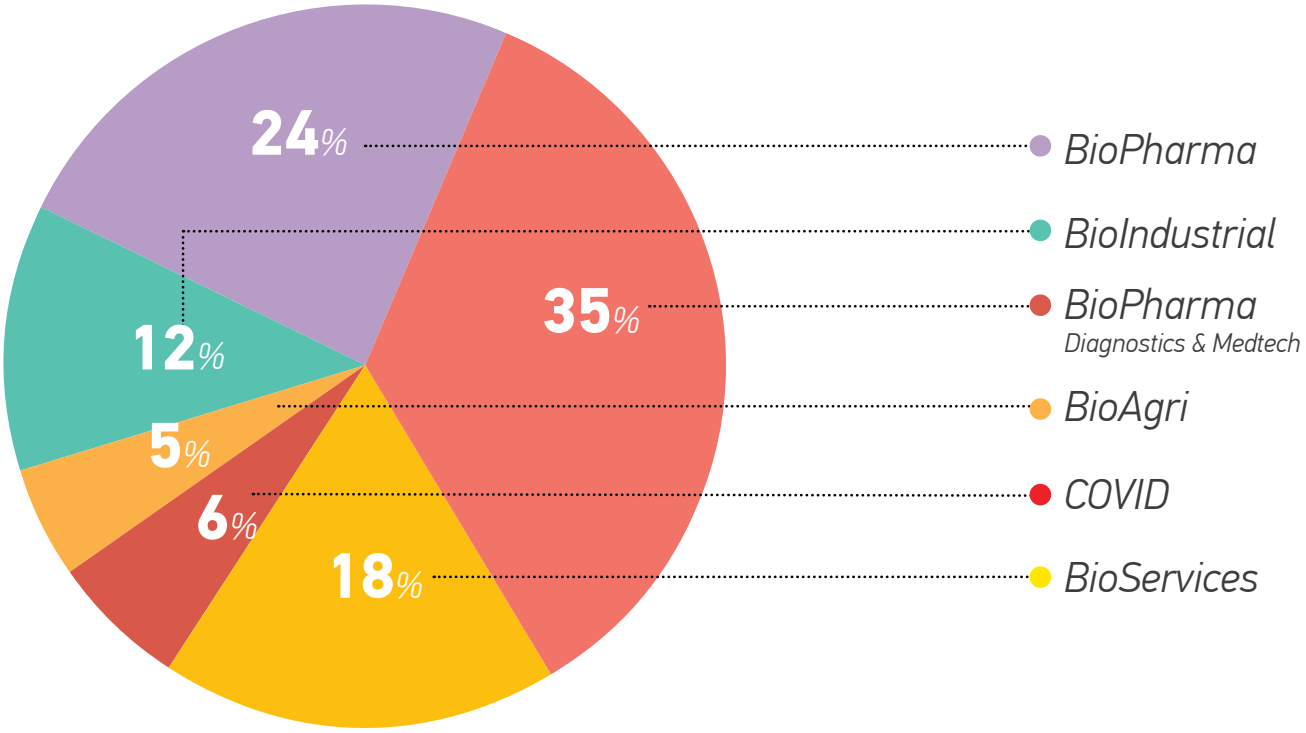
Karnataka however has contribution in few other significant areas like digital healthcare and drug delivery; big data, IoT, and artificial intelligence driven platforms; smart agriculture and smart foods, veterinary science and reagents and analytical businesses. These new segments contribute nearly $5.4 billion in value. Karnataka's BioEconomy including this would reach $21.8 billion. Take for example smart agriculture or agritech. According to Nasscom, Karnataka and Maharashtra together have close to 50 percent of the agri-tech start-ups. In term of funding nearly two-thirds (67%) of the total funding received by start-ups has gone to Karnataka's start-ups.



BioEconomy ($ bn)

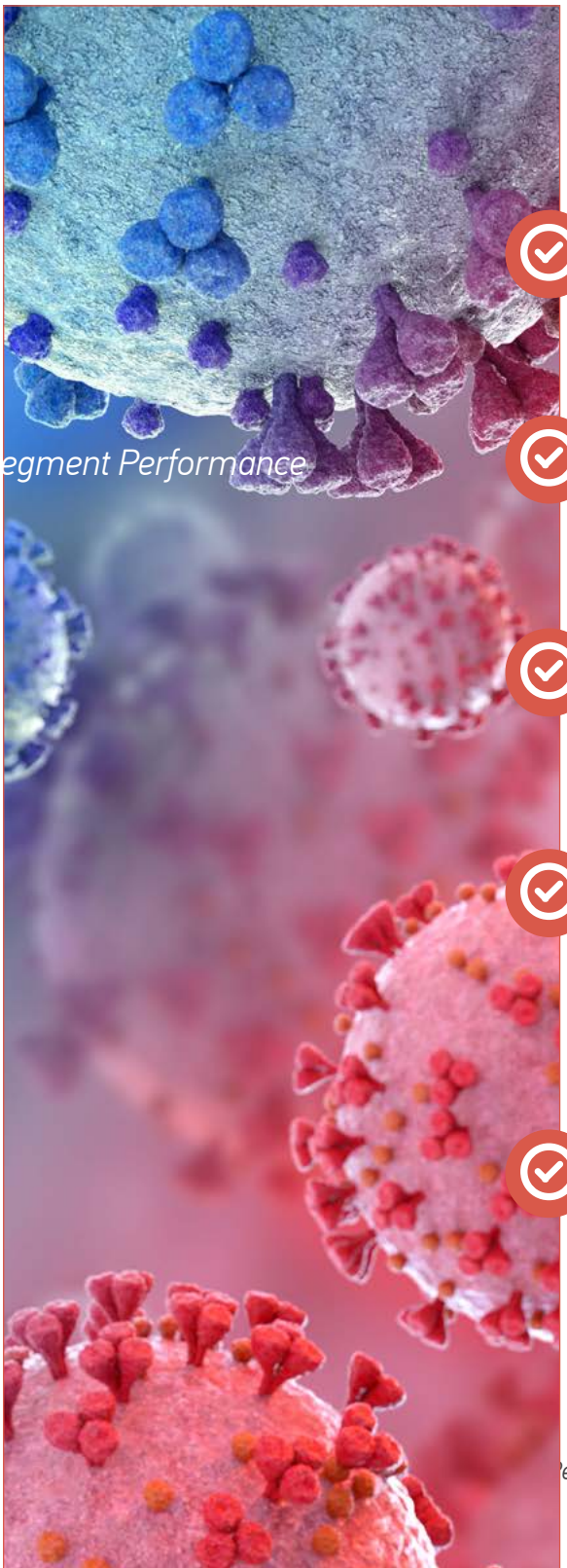
HERE IS HOW KARNATAKA'S BIOECONOMY PERFORMED IN 2021 (STANDARDIZED ACROSS COUNTRY)

- The BioEconomy of Karnataka grew by 21% to reach $16.4 bn by bioeconomic value.
- The BioEconomy of India was valued at $80.7 bn in 2021 and the national growth rate was about 15% growth.
- Karnataka was the second largest contributor to India's BioEconomy. It accounted for 20 percent share of the national BioEconomy beyond Maharashtra, which garnered over 23 percent share in the national economy.
- In terms of percent share of GSDP, Karnataka's BioEconomy accounted for nearly 7.32 percent share of $224 bn GSDP in 2021. Karnataka's share of GSDP in 2020 was 5.91 percent.
- Karnataka witnessed 95 new start-up formations in 2021 taking the total Biotech start-up base since 2017 to over 475 companies.
- Covid Economy and BioIndustrial segments were the two major contributors to Karnataka's BioEconomy in 2021 with triple digit growth. While Covid-19 based BioEconomy grew by 130 percent, BioIndustrial saw phenomenal 122 percent rise. These two segments infused additional $1.6 bn in value and generated 9.75 percent value share.
- Karnataka has a very diverse and established biotech industry and the state's BioEconomy is in a very strong position today due to a well-organized ecosystem.



Covid Economy

A new segment, recorded 130% growth



- *Covid Economy stood at $971 million*
- *Vaccine Economy's contribution was $518 million*
- *Covid-19 Testing Economy generated $453 million*
- *Karnataka's share of India's Covid-19 BioEconomy was 6.7 percent*
- *Vaccines generated over 53 percent BioEconomy by value*

Covid-19, Testing

The BioEconomy was primarily driven by prevailing Covid-19 situation. The economy, led by tests to detect Covid-19 and vaccination coverage to protect people of Karnataka, has seen 130 percent growth in 2021 in terms of value. The entire new segment accounted for 6.7% share of the $16.4 billion BioEconomy of the state.

Covid-19 Testing: Karnataka has carried out a cumulative of 65.6 million tests as on April 1, 2022. Out of these 65.5 million tests, bulk 52.9 million (81%) were RT-PCR and other tests, while the rest 12.8 million tests were rapid antigen detection methods.

In 2021 alone, a total of 42.4 million tests were conducted, while the tests in the corresponding period of 2020 were 14.2 million. The Testing saw 199 percent growth in terms of number of million tests and 16.7 percent growth by BioEconomic value. The BioEconomy value of Testing for the whole calendar of 2021 stood at $492.5 million at an average price of $11.65 per test. The same during calendar year 2020 was $422 million at nearly $30 per test. Testing accounted for 49 percent share of Covid Economy in 2021.

Karnataka had over 222 labs doing Covid-19 tests. State was the fourth largest in terms of labs.

Karnataka accounted for nearly 8 percent share of the total Covid-19 testing of 500 million in the country in 2021. It was the third largest state for testing after Uttar Pradesh and Maharashtra, which has an estimated 75 million tests and 65 million tests respectively. Karnataka has a very important place in developing products for the Covid-19 Economy, especially in the Diagnostics space. The Indigenisation of Diagnostics (InDx) platform was set up under guidance of the Principal Scientific Adviser to the Government of India at C-CAMP. It was to build large capacity of COVID-19 molecular diagnostic kits and reagents. This program led to establishment of a strong supply chain network of Indian MSMEs and help build capacities.

The outcome of this program is that the nation was able to assemble 2 million indigenous diagnostic kits per day. The program is funded by the Rockefeller Foundation and is executed by C-CAMP at Bangalore Life Sciences Cluster (BLiSC), in collaboration with Centre of Excellences (CoEs). This program saw mobilization of over 190 companies and the prices of some of the diagnostics were brought down to as low as $1 from $25.

The state had a very high number of independent testing labs reporting to ICMR for Covid tests. According to ICMR circular, by end of December 2021, Karnataka had over 222 labs doing Covid-19 tests. Karnataka was the fourth largest state in terms of labs beyond Maharashtra, Uttar Pradesh, and Tamil Nadu, respectively. The state had 6.7 percent share of the total number of labs, reporting to ICMR. Out of the 222 labs, 76 were government labs, while 146 were private labs.

Covid-19, Vaccination

Karnataka has crossed administering 104 million doses of Covid-19 vaccines as of March 2022 and also achieved 100 percent vaccination for the first dose. Further, four districts in Karnataka — Bengaluru Rural, Vijayapura, Kodagu, and Gadag — have achieved 100 percent second dose coverage. Nearly 86 million doses of Covid-19 vaccines were administered in Karnataka in 2021 alone. The Covid-19 vaccine BioEconomy is estimated around $508 million for whole Calendar Year 2021.

Karnataka's contribution to India's 145 million Covid-19 vaccination achievement till December 2021 occupied about 6 percent of national share. By end of December itself, Karnataka administered 47.64 million (over 95% of eligible population) with a first dose and 38.6 million (75% of eligible people) with a second dose.

Covid-19 vaccination drive was a very complex and herculean effort that involved managing supply chain, demand-supply management, operations management, motivating the healthcare administrators, and overcoming vaccine hesitancy. The state completed 100 million vaccinations in 13 months of launch of Covid-19 vaccines on February 23, 2022.

Preliminary estimates for the Financial Year 2021-2022 (April 2021 - March 2022) indicate that the Covid Economy segment in Karnataka to touch $1.14 billion in value. Between April 01, 2021 and March 31, 2022, the state conducted 45 million Covid-19 tests and administered 104 million doses.

Karnataka achieved another milestone in fight against Covid-19. The state began manufacturing of vaccines. The state is home to major pharma, contract research organizations, global captive labs, diagnostics, digital health care, etc. but did not have significant vaccine manufacturing capacities. However, during Covid-19, state saw setting up of greenfield vaccine plants as well as repurposed plants.

Hubbali-based Shilpa Biologicals, a wholly-owned subsidiary of Shilpa Medicare, agreed to produce Cadila Healthcare Ltd's three-dose COVID-19 vaccine, ZyCoV-D. It aims to make 100 million to 120 million doses of ZyCoV-D a year. Shilpa Medicare also makes the Russian Sputnik V vaccine under an agreement with Indian pharma giant Dr. Reddy's Laboratories. It committed to invest $20-25 million into its Sputnik V vaccine manufacturing facility. The deal with Dr Reddy's Laboratories was to make 50 million doses of Sputnik V.

Bharat Biotech expanded its production of Covaxin to Karnataka. A vaccine manufacturing unit at Malur Industrial Area in Kolar district, which is a subsidiary of Biovet and engaged in the animal vaccine production of Foot and Mouth Disease (FMD) and brucellosis, was approved to manufacture Covaxin supported by the Union government. The facility targeted nearly 50 million doses a month by end of 2021.

Bengaluru's Stelis Biopharma, the biopharmaceutical division of Strides, partnered with the Russian Direct Investment Fund (RDIF) to manufacture nearly 200 million doses of the Russian Sputnik V vaccine. Stelis Biopharma raised $195 million in Series B and Series C rounds at a valuation of $350 million. It has built a greenfield vaccine plant with a 40,000 liters drug substance bioreactor capacity at a 2,000 liters scale, using Single-Use Bioreactor technology and is capable of producing 720 million doses in a year.

Biocon Biologics Limited (BBL), a subsidiary of Biocon Ltd and Serum Institute Life Sciences Private Ltd (SILS), a subsidiary of Serum Institute of India Pvt Ltd announced a strategic alliance. Under the terms of the agreement, BBL will offer approximately 15% stake to SILS, at a post-money valuation of $4.9 billion, for which it will get committed access to a 100 million doses of vaccines per annum for 15 years with commercialization rights of the SILS vaccine portfolio (including COVID-19 vaccines) for global markets.

BioIndustrial Sector

accounted for 12% share

BioIndustrial sector comprising mainly of the BioFuels/BioEnergy segment and Enzymes is one of the fastest growing sectors. The segment recorded 122.2 percent growth.

Karnataka's BioIndustrial value grew from $893 million in 2020 to $1.99 billion in 2021. The growth has come across all sub-segment segments—Ethanol and enzymes. Karnataka was the third largest state in terms of BioIndustrial BioEconomy contribution after Maharashtra and Uttar Pradesh.

BioIndustrial segment accounted for nearly 12 percent share of total contribution of BioEconomy of Karnataka in 2021. The contribution from BioIndustrial segment doubled from 2020, where it accounted for 6.6 percent share.

Karnataka accounted for nearly 18 percent share of India's BioIndustrial BioEconomic value of $5.1 billion

Biofuels registered 421.7% growth

Karnataka is emerging as the hub for sustainable BioIndustrial sector. It has a robust base for both enzymes and Biofuels.

The state is home to over 50 ethanol producers. These producers are very important in helping India achieve 20-percent blending target by 2025. The state is the third largest producer of biofuels and among the states which have reached 9 percent blending of petrol.

Over 50 companies committed to produce ethanol in Karnataka. The state is estimated to have over 5000 KLPD liters installed capacity in few years nearly doubling from the current 2620 KLPD liters installed capacity of ethanol manufacturing. Some of these plants are considered to be the largest in the country.

India's largest capacity syrup-based ethanol plant is being set up by Godavari Biorefineries (GBL) in Karnataka. It is expanding the existing ethanol manufacturing capacity to 600 kilo litre per day (KLPD), using sugarcane syrup. When commissioned, this will become India's largest capacity syrup-based ethanol plant.

The states ethanol-based BioEconomy was estimated at $1152 million in 2021. The state has supplied over 770 million liters of ethanol during 2021.

Indian Government is encouraging augmentation of ethanol production and extended soft loans of nearly $2.5 billion. Karnataka accounted for nearly 18 percent share of the total approved projects in 2020. The estimated loan amount for projects in Karnataka is to a tune of $435 million.

Daily Capacity of Select Companies approved by Oil Marketing Companies for Supply in 2021 from Karnataka

Name of Shortlisted Bidders	Annual Offtake Quantity offered (in KLPD)
Davangere Sugar Company Ltd	30
Haveri Mega Food Park Private Ltd	150
Satish Sugars Ltd	100
The Ugar Sugar Works Ltd	300
NSL Sugars Ltd	40
Shree Renuka Sugars Ltd, Burlatti Village, Belgavi	130
NSL Sugars Ltd Unit 2 Aland	110
NSL Sugars (Tungabhadra) Ltd	110
VINP Distilleries and Sugars Pvt Ltd	70

Bioenzymes recorded 25 percent growth

The BioEnzymes sector grew to $800 million in value.

Karnataka is home to one of the largest and leading enyzmes companies in enzymes business - Novozymes South Asia. The company is engaged in the business of production, distribution and trading of enzymes and micro-organisms for industrial use. It sells “enzymes” and “micro-organisms” in the domestic market within India and in the European region (represented by Denmark, Switzerland, etc). It also has shared service centre for rendering services to Novozymes group companies outside India. A major portion of the industrial enzymes are used in the food and beverage segment. This segment accounts for nearly two-thirds of the industrial enzymes market and is one of the fastest-growing application segments.

The BioEnzymes sector grew from $640 million to $800 million in value. The Indian food enzymes market and the enzymes for beverages is one of the large contributors and accounts for a CAGR of 3.5 percent growth.

The demand for high-quality foods with natural flavor and taste is triggering the industrial enzyme sector, where enzymes help in catalysation of breaking down of vitamins and nutrients in the metabolic reactions and inter-conversion of complex molecules to smaller molecules. Today amylases, cellulases, xylanases, pectinases, proteases, lipases, glucosyltransferases, arabinanases, polygalacturonanace, chymosins, and beta-glucanases are important elements of food additives industry.

As mentioned above, the growth is coming on account of increasing demand for processed food in the country. The Companies are increasingly looking into the using enzymes in the processed food industry. Companies like MTR Foods, ITC, Nestle, Britannia, Cargill, Pepsi, Coca Cola, and Nissin have a strong base here. The state has a strong ecosystem of cold storages, poultry meat production, and organic produce. Karnataka is the leader in Coffee, Ragi, Sunflower, Gherkins among other produce and is home to six Food Parks in Karnataka.

Enzymes play a significant role in brewing. Karnataka houses some of the largest beer producing companies like Jagdale Group, Khodays, United Brewaries, United Spirits, amongst several others. According to State Excise Department of Karnataka, average per month sales of beer were around 19.82 lakh carton boxes and the turnover as per Karnataka State Beverages Corporation Ltd (KBSL) was nearly $550 million. On an average about 33 gm of enzyme mix, that contains 1.6-2 gm of dry form of enzyme is needed to produce about 100 kg of beer. At a cost of nearly $0.002 per gram, the value of 1 liter of beer is nearly $3.7. An enzyme is known to reduce the energy input due to reduced water and energy use and also lower the raw material need. At a conservative workout, the value addition of an enzyme in the whole process is nearly 250-300 times the original price.

BioAgri

touched $794 million

Bt Cotton is the largest contributor to the total BioAgri market of $794 million in 2021. The Bt Cotton's contribution to the BioEconomy of Karnataka stood at $641 million in 2021 compared to $564 million in 2020.

Karnataka is the second largest state in the South zone in cotton production. The Cotton production in the state recorded a growth of 10 percent totaling to 2.2 bales, accounting for 23 percent share in the zone. Karnataka's productivity or yield stood at 17.5 percent with a yield of 488.89 kgs/hectare.

India's cotton exports have witnessed a rise of 105.7 for 2021. In January-September 2021, the raw cotton was traded at $1.95 per kg. The price was $1.48 per kg on average in 2020.

Karnataka is one of the leading states in Biofertilizer and pesticide usage. It is one of the largest (third) in terms of organic cultivation. The total area under organic certification in Karnataka (including conversion) is 93,963 hectares with total Certified Production of 2,82,633 tons according to various estimates.

It is home to over 250 operators and has nearly a lakh farmers. As a result of this support, the state's Biopesticides related economy is valued at $150 million. Taking an average cost of pesticide at $2 per kg (hectare), the value generated by organic farming in Karnataka at an average cost of produce at $0.53 per kg alone is $150 million.

BioPharma

contributed $9.7 billion in BioEconomy

The total BioPharma segment including Medical devices and diagnostics grew to $9.7 billion recording 27% growth. The two key segments are (i) Therapeutics & Vaccines and (ii) Medical Devices & Diagnostics services

The Medical Devices & Diagnostics services of Karnataka accounts for 59 percent share of the states total BioPharma segment, while the Therapeutics and Vaccines accounted for 41 percent share.

Karnataka's BioPharma segment constitutes 24.8 percent share of the country's total BioPharma share of $3.19 billion. The state is second largest in this segment after Maharashtra, which accounts for nearly 27.5 percent share.

Therapeutics and vaccines BioEconomy estimated at $3.95 billion

The therapeutics and vaccines subsegment of BioPharma industry in Karnataka recorded $3.94 billion worth of BioEconomic value in 2021. The therapeutics and vaccines subsegments achieved a robust 36 percent growth in 2021 from $2.9 billion BioEconomy value in 2020.

Karnataka is home to some of the leading BioPharma companies, both Indian and global. While Biocon Group is the home-grown anchor, AstraZeneca, Mylan Laboratories and NovoNordisk are the global majors with significant contributions to the BioEconomy segment from Karnataka.

BioPharma accounted for 23.9 percent share of the total BioEconomy of Karnataka. The state's share of contribution to the national BioPharma stood at 24.8 percent. Therapeutics formed the largest component of the segment.

Cardiac, anti-infectives, anti-diabetic, respiratory, derma, harmones, vaccines and blood producs were some of the important product categories

Bengaluru is the sixth largest state in terms of BioPharma retail market. According to IQVIA data set, Bengaluru's retail BioPharma value was $370 million.

Karnataka is leading player in the Diabetes segment. NovoNordisk and Biocon together have a nearly about 72-73 percent share in the insulin segment. According to Novo

Nordisk, which has the broadest diabetes product portfolio in the industry, including the most advanced products in insulin delivery systems, is a market leader with over 60% volume market share in insulin. It has almost 51 percent volume market share in the modern insulin and new generation insulin business and continues to focus on this segment.

Biocon on the other hand has supplied nearly 2.75 billion doses of rh-insulin to people across the globe. Biocon has been focusing on providing affordable rh-insulin and biosimilar Glargine. According to Biocon, Malaysia is benefiting from its portfolio of products by reducing its diabetes management outlay by nearly 50 percent.

Oncology is a significant segment. Biocon was the first to have launched and developed Trastuzumab for patients of HER2-positive metastatic breast cancer. Biocon also played an important role during Covid-19 pandemic. Its repurposed Itolizumab was used for treating COVID-19 patients. It also ensured deliveries of over 3,750 shipments of Generic APIs and Formulations to over 60 countries and 670 shipments of life-saving biosimilars across the globe. Biocon Group also conducted over 2 lakh RT-PCR test and supplied over 2 billion statin pills to patients in USA.

Eighty percent of Biocon's business comes from international markets. This is similar with many other local companies in Karnataka like Anthem, Strides / Stelis, and Shilpa.

One of the most exciting developments in Karnataka was starting of vaccine manufacturing operations. Stelis, which is part of Strides Pharma Science Ltd, is a vertically integrated biopharma and vaccines company. It developed the capabilities to develop and manufacture complex biologics, biosimilars and vaccines. Stelis comprises of two specialist business divisions global CDMO and specialist vaccines CDMO. It has an Integrated global vaccine CDMO business with large capacity and diverse capability to produce over 1 billion doses in a year. The company starting supplying Sputnik V components and is having advanced discussions to In-license new vaccine technologies and hopes to on-board few CDMO Contract on vaccines.

Shilpa is another Karnataka company which is working to manufacture Sputnik Light Drug Substance. It has also initiated arrangements for the manufacture of ZyCoV-D. It has also made significant progress on clinical trials with its own portfolio of products for Adalimumab and Aflibercept respectively. Bharat Biotech had set up its Bangalore facility for COVID-19 vaccine production as well.

Karnataka now leads in BioSimilars area. The subsidiary of Biocon Ltd, Biocon Biologics Ltd (BBL), is focused as BioSimilars company and it recently announced a definitive agreement to acquire Viatris' biosimilars business to create a unique fully integrated global biosimilars enterprise. Viatris will receive consideration of up to $3.3 billion. BBL also announced access to the vaccines portfolio through its partnership with Serum Institute Life Sciences (SILS). This acquisition is considered to be transformational and will create a unique fully integrated, world leading biosimilars enterprise.

BBL has a 200,000 sq. ft state of the art Research & Development Centre at Biocon Park, Bengaluru, India and a product pipeline of 28 molecules, including 11 with Mylan, few with Sandoz and rest on its own. It focused in Diabetes, Oncology, Immunology, Dermatology, Ophthalmology, Neurology, Rheumatology and Inflammatory Diseases.

Medical Devices and Diagnostics services

produced $5.8 Billion in BioEconomy

The combined subsegment of Medical Devices and Diagnostics is the largest contributor to total BioEconomy of Karnataka. It accounted for 35 percent share of the state's BioEconomy. The Medical Devices and Diagnostics services as a subsegment generated $5.8 billion in value and recorded 21 percent growth compared to $4.8 billion estimated in 2020.

Karnataka occupies 28 percent share of the national Medical and Diagnostics services pie. Maharashtra is the next largest state with 20 percent share at all India level.

Medical Devices

Karnataka is also a leading player in the manufacture of insulin pens, cardiac stents and implants, medical IT, and PCR machines

The Medical Devices subsegment is estimated to have contributed $3.7 billion in value in 2021. This subsegment registered nearly 37 percent growth due to medical devices and supplies.

The state's dominance in the Medical Devices industry can also be ascertained to the fact that all the leading companies in the medical devices area are established in Karnataka. Some of the major global players include Alcon, Essilor, GE Healthcare, Medtronics, Osstem Implants, Philips, Siemens, Teleflex, Thermo Fisher Scientific, Waters, and Zeiss. Some of the large home-grown companies include BPL Medical Technologies, Chesa Dentalcare, Dolphin Sutures, Hemogenomics, Opto Circuits, Skanray Technologies, and Sutures India.

The medical devices industry comprises four subsegments – (i) instruments and equipment, (ii) diagnostic imaging, (iii) consumables and implants, and (iv) patient aids and others.

Instruments and equipment comprising of devices like dental products, ophthalmic instruments, sterilizers, and therapeutic respiration kits account for the largest portion

Karnataka is also a leading player in the manufacture of insulin pens, cardiac stents and implants, medical IT, and PCR machines. These products are being developed by manufacturers such as Bigtec Labs, Biocon, GE Medical, and Skanray.

Diagnostics service sector

The Diagnostics services sector mainly comprises of pathology testing services and imaging diagnostic services. Diagnostic services are amongst the lowest priced in the world and the price of testing has remained flat.

The total Indian diagnostics services industry is estimated at $9.5 billion and is expected to grow at a compounded annual growth rate (CAGR) of 12-14 percent over the next five years. The Indian diagnostic services market is amongst the fastest growing segments in the healthcare market. This subsegment here is characterized by high volumes and low-cost of testing.

The market share is categorized as: unorganized (46%), hospital-based lab (37%) while the remaining (17%) is with the organized players. The government-led programs and efforts in increasing the testing facilities in rural areas is pushing the penetration of Diagnostics in the state.

Services: Pathology testing or invitro diagnosis involves the collection of samples in the form of blood, urine, stool, etc., and analyzing them using laboratory equipment and technology to arrive at useful clinical information that assists in treatment of diseases. It includes biochemistry, immunology, hematology, urine analysis, molecular diagnosis, and microbiology.

Imaging diagnosis or radiology involves imaging procedures such as X-rays and ultrasounds that help determine anatomical or physiological changes inside a patient's body, thus as-

Karnataka has 178 diagnostics labs having National Accreditation Board for Testing and Calibration Laboratories (NABL) certification

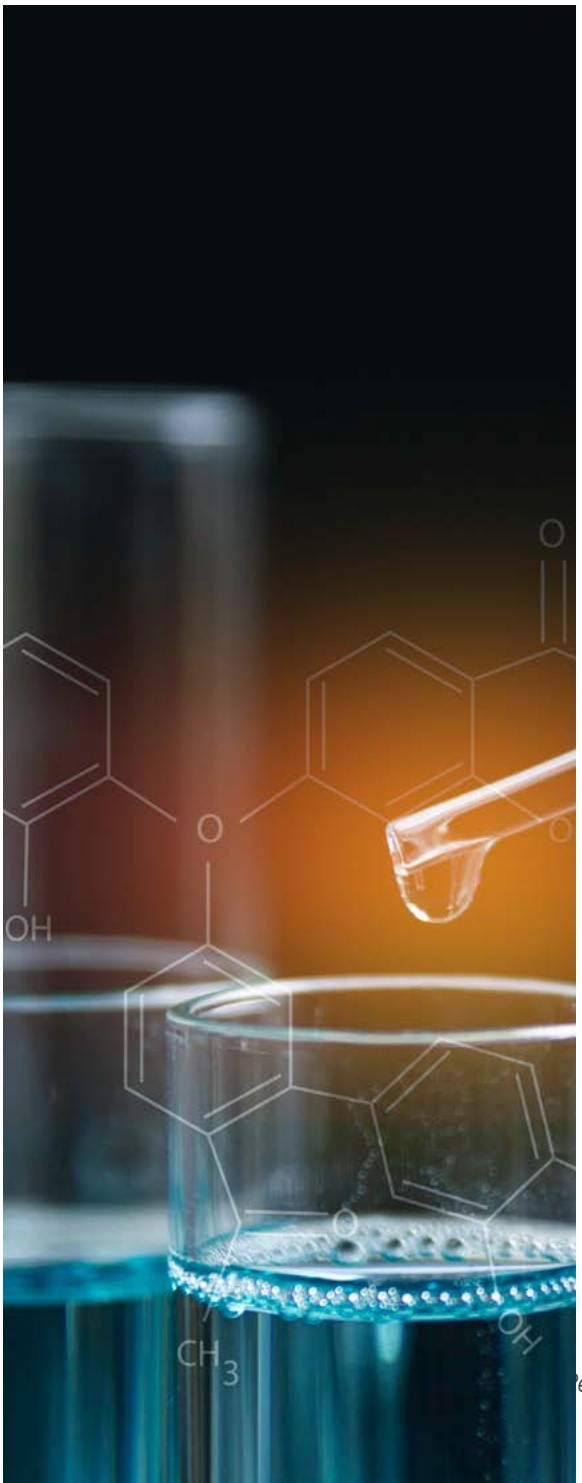
sisting doctors in diagnosing. It includes more complex tests such as CT scans, MRIs, and highly specialized PET-CT scans.

Organized healthcare service providers with established credentials are setting up centres in tier II and III cities. These include the centers like the Apollo healthcare group, SRL Diagnostics, Fortis, Manipal, Aster CMI, Trident Diagnostics, Rashi Diagnostics, etc.

Karnataka has 178 diagnostics labs having National Accreditation Board for Testing and Calibration Laboratories (NABL) certification. Karnataka accounts for nearly 8 percent share of the total NABL-certified Diagnostics labs in the country after Maha (319), TN (282), UP (207), Delhi (8%). Karnataka conducted nearly 70 million tests and another 70 million radiology diagnostics. Even at an average cost (very conservative) of test of $13.5 and radiology test of $27 the Diagnostics services BioEconomy is in excess of $2.1 billion.

CRO/CDMO segment

generated $2.99 bn BioEconomy



Karnataka is home to some of the leading integrated contract research (CRO) and contract development manufacturing organizations (CDMO)

Some of the leading names in Karnataka are Aurigene Services, Aragen, Eurofins Advinus, Jubilant Biosys, Kenwell Biopharma, Laurus Bio (formerly Richcore Lifesciences), and Syngene International. Some of the large companies create bioeconomy value of $300-400 million, while the medium size organizations are creating $100-250 million in value.

CRO/CDMO business from Karnataka is conservatively estimated at $2.99 billion in BioEconomy. This segment accounted for 18.17 percent share of Karnataka's BioEconomy and registered 20 percent growth in 2021.

Karnataka leads the CRO /CDMO operations in the country with nearly 55 percent share of the total CRO / CDMO market. The total estimated infrastructure of CRO / CDMOs in Karnataka is 2-3 million sq. ft. CROs are expanding their facilities and operations.

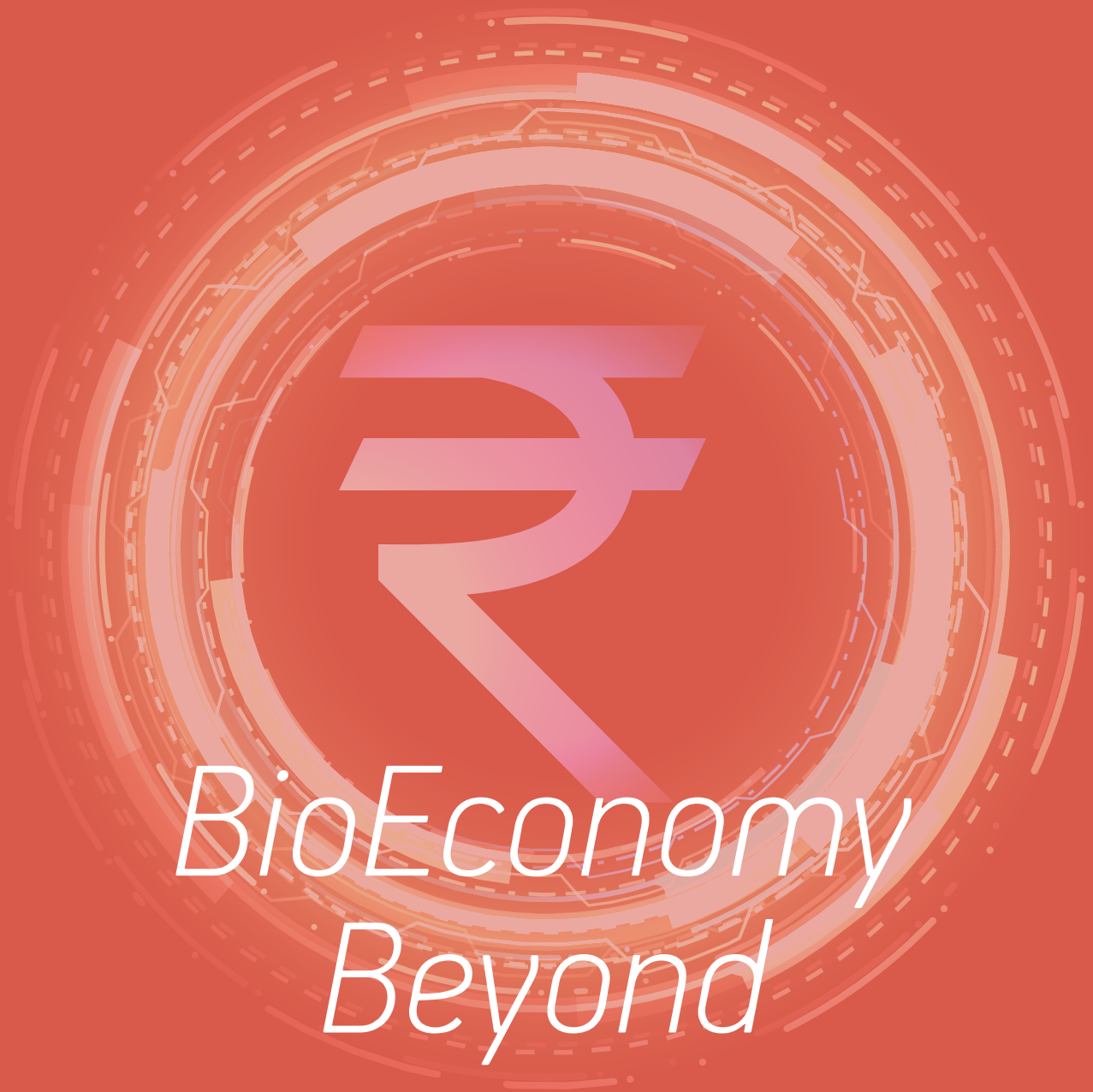
Aragen recently expanded its Bengaluru campus to add 75,000 sq. ft. of new infrastructure. The new facility houses chemistry, biology, analytical chemistry and vivarium labs that can accommodate over 250 research scientists and other enabling teams.

The total estimated infrastructure of CRO / CDMOs in Karnataka is 2-3 million sq. ft. CROs are expanding their facilities and operations

Syngene International also announced expansion of its biomanufacturing capacity. It commissioned a new microbial cGMP facility and has also expanded the capacity of its mammalian cell manufacturing facility to extend end-to-end Chemistry, Manufacturing and Control (CMC) development solutions for its global clients. Both facilities are located at its Biocon Park campus in Bengaluru, India. The new microbial facility has two fermenters of 200 Litres and 500 Litres capacity. It will add another 2000L single use bioreactor to the USFDA and EMA compliant mammalian manufacturing facility. Syngene's FY22 capex plan included spending of $100-120 million.

Kemwell and Cipla signed a joint venture agreement to develop, manufacture and commercialise biosimilars for global markets. The joint venture will leverage Cipla and Kemwell's complementary strengths for end-to-end product development, clinical development, regulatory filings, manufacturing and commercialisation of biopharmceutical products. While Cipla's strength is in the respiratory area, Kemwell's strength lies in biologics.

Laurus Bio, formerly Richcore Life Sciences, expanded its operations at Tumkur, which has a state-of-the-art 180 thousand Litre fermentation capability which can produce multiple recombinant biotechnology products for Biopharma, Cell culture and Food industries.



BioEconomy Beyond Traditional

ADDITIONAL OTHER BIOTECH SEGMENTS (AOBS)

Karnataka is a pioneer and took initiatives to help create a multi-disciplinary ecosystem like in the Digital Healthcare and Drug Delivery; Big Data, IoT, and Artificial Intelligence driven platforms; Smart Agriculture and Smart Foods, Veterinary Science and Reagents and Analytical Businesses. These new segments are valued at nearly $10.5 billion in value.

Agritech, Animal, Marine, dairy biotech, sericulture	$1.80 Bn	Growth (6%), Share (17%)
Digital health, BioIT, BigData, “omics”	$5.65 Bn	Growth (15%), Share (54%)
Biotech reagents and analytical instruments	$1.10 Bn	Growth (16%), Share (10%)
Other Biotech including research, bioremediation, clean water, environmental biotech, new drugs / platform research, etc. Captive clinical data management centers, R&D services centers	$1.95 Bn	Growth (117%), Share (19%)
Total of Additional Specific Segments	*$10.5 Billion*	*Growth (24%)*

Karnataka generated $5.65 bn Bio-IT BioEconomy

Karnataka is home to several leading IT companies that have dedicated practices for the life sciences and health care.

According to NASSCOM and various other sources the software exports from Karnataka in 2021 alone stood at nearly $110 billion. A quick analysis of the annual reports of the top exporters from Karnataka indicate that nearly 10-12 percent of the total value of company's income comes from the healthcare and life sciences practice. For instance, TCS has $2 billion from life sciences, Wipro - $ 1 billion, Infosys - $ 1.1 billion, HCL - $1.6 billion, Tech Mahindra - $511 Million, L&T - $109 Million, Cognizant - $1.4 Billion. And nearly 5-6 percent of this activity is towards core biotech. A very conservative estimate of the BioEconomy from Bio-IT amounted to $5.65 billion in 2021.

Further all the leading global players like Accenture, Ernst & Young, CapGemini, Genpact, have strong healthcare and life sciences practice from Karnataka.

Here are highlights of the tops rated companies in this sector.

TCS: The Life Sciences and Healthcare business of TCS grew 17.1%. One interesting project TCS executed in the Life Sciences domain was using it innovative platform to streamline drug development processes, speed up clinical trials, and help pharma companies rush new therapies and vaccines to the market. To augment the requirement for ventilators and help manufacturers increase production, TCS worked with the engineers at GE Healthcare to automate the late-point configuration of ventilators. This reduced the production time per ventilator by 6 minutes, enabling production of an additional 340 ventilators per month, helping ease suffering and saving lives. TCS launched COVID-19 Testing and Vaccine Management Suite of modular, easy-to-deploy solutions that leverage AI, robotics, blockchain and the Internet of Things (IoT) to streamline every stage of the end-to-end testing and vaccination journeys, enabling more individuals to get tested and vaccinated faster and return to normal life experiences.

TCS has a platform called ADD that transforms the end-to- end drug development process which is at the core of any life sciences company's value creation engine. In 2021, one of the world's largest pharmaceu-

tical companies deployed this solution to transform the oversight of over 200 clinical trials, strengthening oversight effectiveness and improving the efficacy of the studies. It has a software-as-a-service platform (CCT) that enables life sciences companies to significantly transform patient engagement in clinical trials and improve adherence to protocols, as well as the efficiency and accountability of clinical trials.

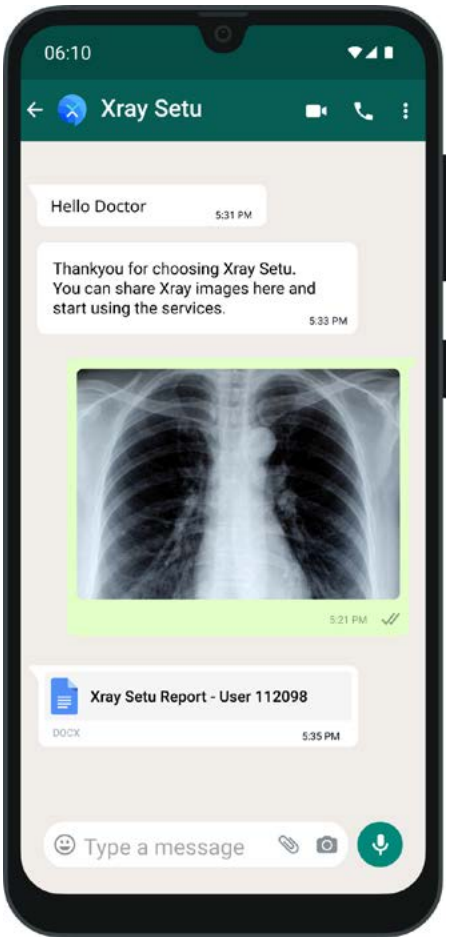
Wipro was recognized as a Leader in Everest Group's Intelligent Automation in Healthcare – Solutions PEAK Matrix® Assessment 2022. Today the healthcare and medical devices, life sciences, and industry are a part of Wipro's global line of business under America 1 and the life sciences streams contribute 12% to 15% of Wipro's overall revenue, its second-largest industry segment according to Wipro. Wipro's capabilities are across the value chain that help delivering CRO services or potentially becoming a pharma. It helps integrate a full stack of emerging tech-enabled products such as Digital Integrated Clinical Enterprise (DICE), virtual trials driven by AI, and advanced data analytics and digital technologies.

Infosys has a life sciences and healthcare go-to-market practice. Infosys helps in Innovation driven by new technologies and advanced digital capabilities that help accelerate speed-to-market and enhance areas like R&D, clinical trials, manufacturing and global supply chain planning.

Tech Mahindra has a dedicated practice and two of top 10 biotech companies and six top medical devices companies in the world are its clients. The company's team developed solutions to help Government combat COVID-19 pandemic including: A predictive tool for modelling the spread of Virus using SIER Modelling, ePass to help control people movement, etc. It also leveraged artificial intelligence to research on potential therapeutic drugs for treatment of COVID-19 along with Reagene Biosciences.
The above just a few examples to illustrate the kind of solutions that the IT companies are proving to the biotech and life sciences enterprises.

Other Biotech Innovations & Research platforms valued at $1.95 Billion

Karnataka has a ecosystem of large number of biotech companies. Many of them are working on cutting edge products, technologies and research, which may not have direct revenue at this time. But they play a vital role in the BioEconomy contributions.



Here are a few examples to explain such developments

Covid diagnosis via X-ray images and using WhatsApp: Startups in Bengaluru devised a new technology called XraySetu that will help India deal with the second wave of Covid-19. The AI-driven technology uses X-ray images sent via WhatsApp to help determine if the person is suffering from Covid-19. XraySetu is developed by Artpark, a not-for-profit foundation established by the Indian Institute of Science (IISc), Bengaluru, with support from the Department of Science & Technology (DST), Govt. of India, in collaboration with Bangalore based HealthTech startup Niramai and the Indian Institute of Science (IISc). It has served over 12,000 plus reports. Besides Covid-19, the platform can also detect 14 other lung-related ailments, including tuberculosis and pneumonia, alongside others. IISc promoted Artpark has received the support of $30 million (Rs 230 crore) from the Department of Science and Technology under National Mission on Interdisciplinary Cyber-Physical Systems and Karnataka government, to develop AI and robotics facilities to support technology innovations.

Digital portable X-ray machines: A device that weighs 1.8 kg and is battery-operated was developed by ITIE Knowledge Solutions, along with a South Korean-based company HDT. This Portable X-Ray is

equipped with Artificial Intelligence (AI) analysis to help in the early diagnosis and better monitoring of patients infected from Covid-19 disease. Mobile diagnostic testing lab for COVID-19: The mobile labs solution that enables the same gold-standard based testing of RT-PCR at the door-steps of the individuals with a significantly reduced turnaround time while retaining the throughputs as that of the centralized labs.

CoronaOven: Log 9 Materials, a Bengaluru-headquartered nanotechnology start-up, launched CoronaOven that makes use of UV-C light (having a wavelength of 253.7 nm) in combination with significant design parameters. The device disinfects surfaces (of various objects, personal protective equipment, etc.) from germs including bacteria and viruses. This unique multi-focal UV disinfection chamber that claimed to sanitise any surface within 4 minutes. CoronaOven is available in different sizes like 20-litre, 33-litre, 40-litre and 440-litre variants.

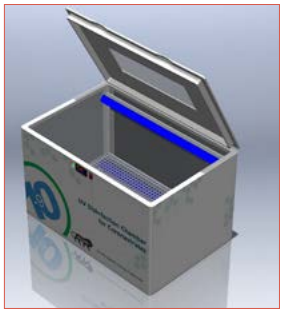
Dozee: Created by Turtle Shell Technologies, the device can help with a preliminary diagnosis of various illnesses which reduces the time spent in making decisions to visit hospitals and go through multiple tests. It is a smart contact-free health monitor that one can slip under their mattress.

PupilMesh: It is founded by Milind M Manoj and Mohammed Hazique Kola and uses 3D printing expertise to meet the demand of face shields, ventilator mask and ventilator valves in the country. They have successfully manufactured the first set of face shields, aerosol boxes and deployed a couple of testing booths in Bangalore.

3D printed splitter: It is a unique ventilator expansion device that allows a single ventilator to support up to two or four patients during a time of acute equipment shortage. It is specifically designed to bypass ventilator deficiency.

RespirAID: Biodesign Innovation Labs developed an automated respiratory assist device that provides Intermittent Positive Pressure Ventilation.

These are just a few examples. There has been good work carried out in nutraceuticals. Mallipatra Nutraceuticals developed an immunity booster tea prepared from medicinal mushroom - Cordyceps. Stabicon launched a chewable tablet containing curcumin and Vitamin B12, both the ingredients that help fight inflammation and infection. Aspartika produced immunity booster chapati having mixture of herbs recommended by AYUSH Ministry.



Clinical Data management and global innovation centers

Karnataka is preferred destination for several leading global players to set their data management and global innovations centers. The BioEconomy value generated from such centers can be valued at nearly $1.9 billion

Take for example AstraZeneca India Private Limited. Recently its Global Capability Centre (GCC) launched a clinical data and insights division in India to further strengthen its global presence, and for the management of data-related aspects of its clinical trials. The Clinical Data & Insights team in Bengaluru is a considered as a critical advancement to support its growing global portfolio, and build on internal data expertise. With the centre started its operations recently, the team will continue to expand by sourcing the right talent and resource for future needs.

Reporting into Development Operations in Biopharmaceuticals R&D, the Clinical Data & Insights (CDI) team is responsible for the management of data-related aspects of AstraZeneca's clinical trials, excluding analysis and reporting. CDI division works across therapy areas and portfolios, supporting early and late-stage clinical programmes from Phase 1 to Phase 3 with an integrated end-to-end approach for clinical data, analytics, insights and risk management. Currently a 30-member team, the division is expected to grow to a 100+ member strong team by 2022.

Similarly, Novo Nordisk, Novartis, IQVIA, Ernst & Young, GE, and a host of others companies has operations from Karnataka

BioSuppliers: Merck Life Science Pvt. Ltd, Waters India, GE, and Sartorius Stedim lead the contribution of cutting edge raw materials and reagents.

KARNATAKA HAS THE POTENTIAL TO TAP $50 BILLION BIOECONOMY BY 2025

The products and services were categorized under BioPharma, BioAgri, BioIndustrial, Bioinformatics & Bio-IT, and BioServices. Only sales of r-DNA products, Biologics, Biosimilars, and Vaccines, Enzymes, Bt Cotton and Biofertilizers, BioMarkers, Bioinformatics, Diagnostics, Molecular Diagnostics and services, and Contract Research and Development and Manufacturing were considered.

Karnataka has a great potential for growth and can reach the target of $50 Billion BioEconomy by 2025.

The basic value chain of biotechnology industry comprises of basic research, applied research, integration and development, production and manufacturing, testing and validation, marketing and sales, and post-marketing services. The value chain of the Biotechnology varies across segments on various parameters like volume-price, potential advantage, product characteristics, and maturity. BioEconomy encompasses development and provisioning of bio-based products and services. It takes into consideration the economic, ecological and social impact aspects in the strategy.

The BioEconomy of Karnataka has been growing at a CAGR of 15 percent since FY2016-17. The BioEconomy growth rate slowed down in FY2020-21, but it has shown a rebound in FY2021-22.

Start-ups in Karnataka

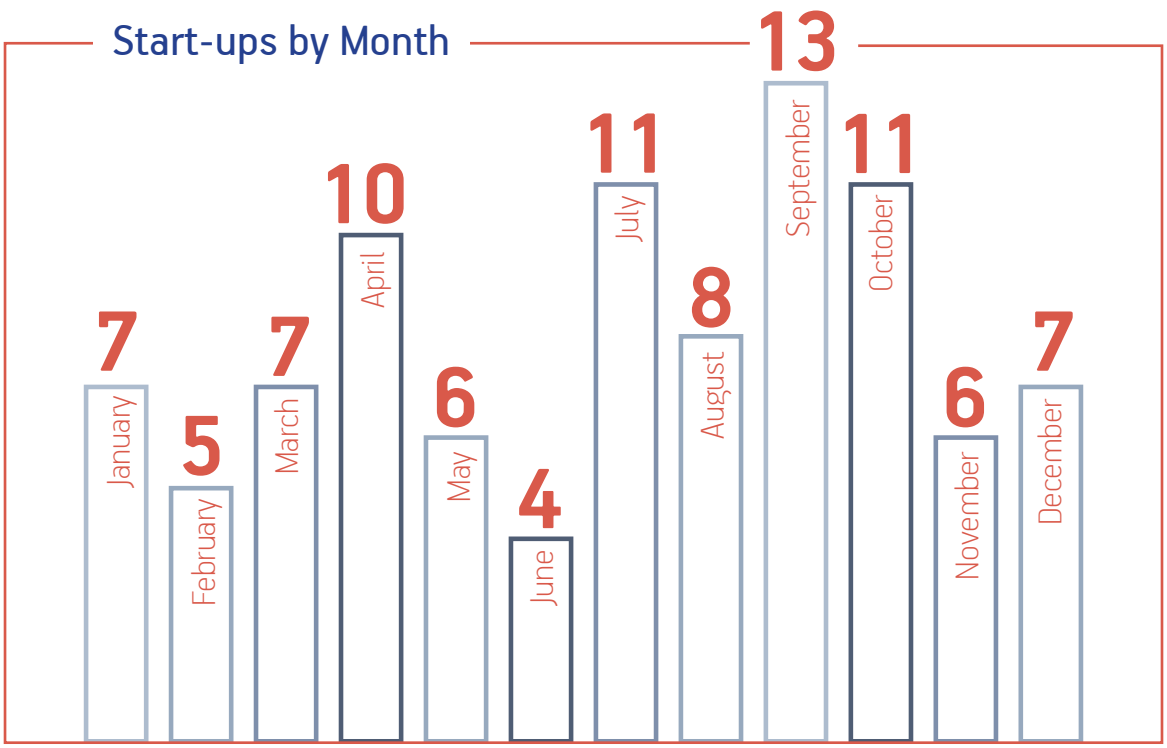
The number of start-ups in the country are on the rise. In Calendar Year **(CY) 2021**, India achieved an important milestone when the number of start-ups registered in the country crossed the **1,000 mark**. The total number of companies that were estimated to have been set up till end of **December 2021** was **1,128**.

Amongst the **95 start-ups** registered in Karnataka in CY2021, a majority (34 percent) of the companies were in the diagnostics area. Manufacturing registrations too saw a rise. It was the second largest category and accounted for 31 percent share. Nearly 27 percent of the companies can be classified under lifesciences and biotech research across health and agriculture. About 5 percent of the companies were in the Biofuels segment.

Categories of companies registered

- **32** companies — Diagnostics
- **29** companies — Manufacturing
- **27** companies — Research & Business Services
- **05** companies — BioFuels

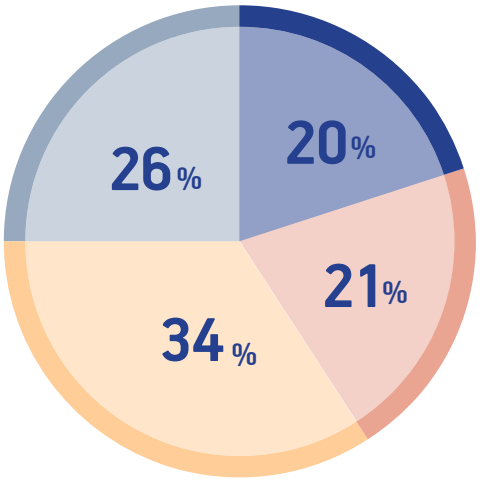
Start-ups by Month



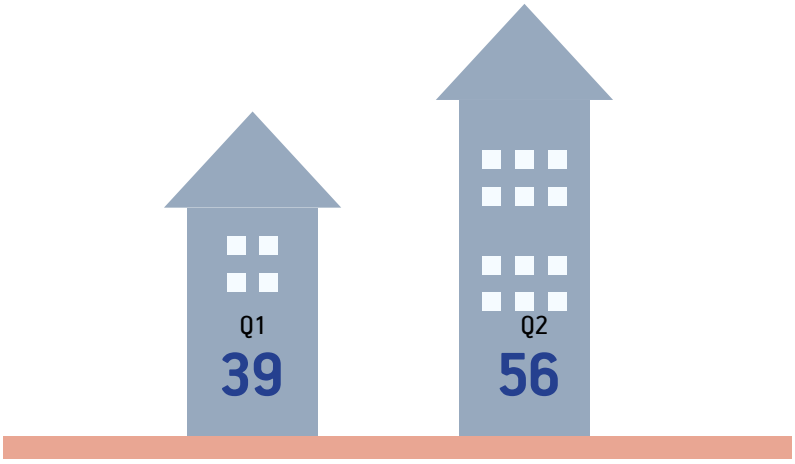
September month saw the highest registrations of 13 new start-ups in 2021. July and August saw 11 registrations each.

Quarter-wise share of Start-ups

The first half of the year saw **39 companies** registered. The second half of the year had **56 companies** and accounted for **59 percent** share of the total companies



Half yearly progress

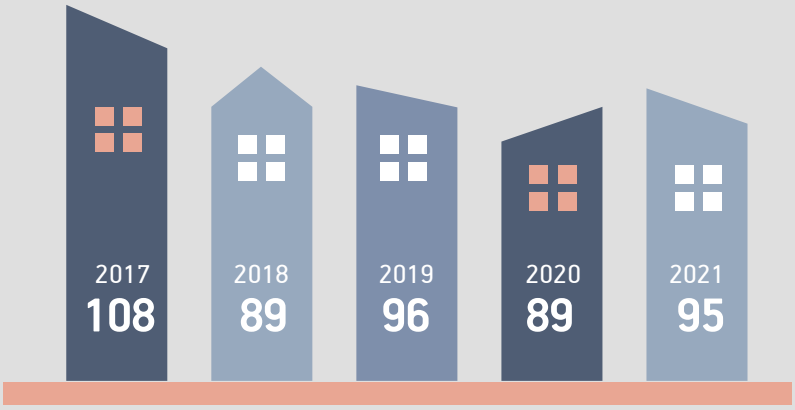


Mumbai, Delhi, Hyderabad, and Bengaluru are the cities of choice of registration of startups. These four cities account for 43% share of the total registrations.

Karnataka is at a threshold from where it can further leap forward to a better world with Support to BioEconomy by supporting the ecosystem and removing the barriers.

A total of 477 companies were registered in Karnataka during 2017-2021. During this time, nearly **4,343** were registered nationally. Karnataka accounted for around **11 percent** share of the number. Out of these start-ups in the Karnataka **61 percent** of them are **3-5 year old** companies, while **39 percent** of them were set up in the **last two years**.

New Start-ups Base 2017 - 2021



SELECT LIST OF START-UPS IN 2021

Ekosight Technologies

EkoSight is an Agritech company with the vision to make soil testing highly accurate, accessible, affordable, and sustainable. It helps farmers increase their crop yield, reduce the cost of fertilizers, increase their profit margin, avoid soil solution and crop poisoning due to over fertilizers.

https://ekosight.com/

Agrewa Farmtech Pvt Ltd

Agrewa commits to build a robust and dynamic eco-system where in services such as farm planning, knowledge center, tech support, finance and insurance are made available at their finger tips or just a call away. The online platform, ebeej.in is designed to cater to different kinds of farmers and their needs.

https://agrewa.in/index.html

Danammadevi Enterprises Pvt Ltd

Danammadevi is focused on hi-tech agriculture farming solutions for Green House, Net House, Fan Pad System, Storage, Tissue Culture Lab. It is engaged in solutions for control of atmosphere.

http://danammadevienterprise.in/aboutus.aspx

Vasishth Genomics Research Labs Pvt Ltd

Services includes a comprehensive consult to help identify gaps and opportunities, a comprehensive report that includes a project plan with timelines and milestones, a cost analysis, and a schedule.

https://vasishthgenomics.in/

Vitaliz Biosciences Pvt Ltd

Vitaliz offers a number of nutritional ingredients like Essential Fatty Acids, Enzymes, Fortified Probiotics and ingredient formulations. Also formulates ingredients for industrial sectors like Milk and milk products including butter, cheese, ghee etc., edible oils, chocolates, confectionery, bakery, malted drinks, baby foods etc.

http://vitalizbiosciences.com/

Athreya Bio Technologies Pvt Ltd

Athreya aims to capture atmospheric carbon dioxide more efficiently and store in organic form using earths terrestrial system as a sink. Carbon capturing efficiency of the plants is increased up to 60 percent by increasing the efficiency of photosynthesis through photosynthesis stimulator technology and the technology is universal.

https://athreyabiotech.com/

SELECT LIST OF START-UPS IN 2021

Thinkmolecular Technologies Pvt Ltd

ThinkMolecular Technologies is a molecular simulations company working in the space of new drug discovery.

https://thinkmolecular.in/about-us/

Regenco Innovation Pvt Ltd

Regenco Innovation is an additive manufacturing company primarily focused on developing 3D tissue-engineered constructs and other bio-fabrication platforms.

http://regeninno.com/

Shroom Technologies Llp

Shroom targets reduced negative environmental damage with sustainable use of materials that are Eco-friendly. It aims to make biodegradable packaging materials that replace plastic and plant-based packaging materials.

https://prithvi70.wixsite.com/shroom

Karyome Pvt Ltd

Karyome Pvt Ltd provides solutions for the scientific communitys. It is into services like preclinical studies, in-vivo and in-vitro studies, computational biology, next generation sequencing analysis, metagenomic analysis, machine learning, and statistical analysis. It also provides support to develop databases, algorthims and softwares for research.

https://karyome.in/

Cubebio Ai Pvt Ltd

Principal focus is to discover drug repurposing candidates using AI and data analytic techniques, and perform primary experimental validations.

http://cubebioai.com/

Newtech Bio Fuels And Agro Products Pvt Ltd

It is company which produces Compressed Bio Gas using the latest second generation technology. It also manufacture high quality organic fertilizer which ensures a good agricultural output.

https://newtechbiofuels.com/

Biotech | Energy & Cleantech

SELECT LIST OF START-UPS IN 2021

Agaricus Solutions

Agaricus solutions presents "SW-ANGLO PRODUCTS". Green-eco-friendly products - sustainable and have low Carbon footprint, which replace Styrofoam, Packaging materials leather, Insulation, furniture and building blocks materials with similar performance to traditional engineering materials.

http://www.agaricussolutions.com/

Urjalinks Technology India Pvt Ltd

Leading the innovations in energy management and demand response

http://www.urjalinks.com/

Parisara Mitra

Parisara Mitra is a Waste Management startup based in Bengaluru which provides end to end waste management solutions to Households, Industries, Warehouses and other Waste Generators.

https://parisaram.com/

Infyuva Tech Solutions Pvt Ltd

Services includes a comprehensive consult to help identify gaps and opportunities, a comprehensive report that includes a project plan with timelines and milestones, a cost analysis, and a schedule.

https://vasishthgenomics.in/

T3 Molecular Genetics Pvt Ltd

To innovate proprietary technology to modulate regulatory T cells to conquer biggest clinical challenges and to innovate breakthrough in Immuno-therapeutics against Inflammatory diseases and infectious diseases.

https://t3mgen.com/

Aarogyaai Innovations Pvt Ltd

AarogyaAI aims to diagnose drug-resistant tuberculosis (DR-TB) using Artificial Intelligence in a few hours. It enable quick and accurate diagnosis of DR-TB so that the patient can be rightly prescribed effective drug combinations for treatment, instantly.

https://aarogya.ai/

SELECT LIST OF START-UPS IN 2021

Sparcolife Digital Healthcare Technologies Pvt Ltd

Conceptualized with the intent of addressing the problems that the digital lifestyle has brought upon human health & performance. Popular belief is that It should take time out from our digital obsessions.

https://www.sparclife.co/

Healthseq Precision Medicine Pvt Ltd

Founded by experienced scientists with a single minded goal of developing solutions in precision medicine using a systems engineering approach, combining data from variety of sources to enable targeted therapy, reduce risk and increase efficiencies in the healthcare system.

https://www.healseq.com/

Tad Aircon Pvt Ltd

Tad Aircon team is working towards realizing its commitment of healthier, cleaner and sustainable indoor air quality.

https://www.tadaircon.com/

Rakshobhya Healthcare Pvt Ltd

Karyome Pvt Ltd provides solutions for the scientific communitys. It is into services like preclinical studies, in-vivo and in-vitro studies, computational biology, next generation sequencing analysis, metagenomic analysis, machine learning, and statistical analysis. It also provides support to develop databases, algorthims and softwares for research.

https://vaximum.in/

Astromeda Space Pvt Ltd

It research and technology development company focused on health, wellness and nutritional requirements in extreme environments

http://www.astromeda.in/

Aikenist Technologies Pvt Ltd

It research and technology development company focused on health, wellness and nutritional requirements in extreme environments

https://www.aikenist.com/

SELECT LIST OF START-UPS IN 2021

Mhealthie Technology Pvt Ltd

Digitally store vaccination and immunization records safely and make it available at the fingertips of the users.

https://www.mhealthie.com/

Pneoterik Scientific Devices Pvt Ltd.

Pneoterik is a one stop solution for "air cleaning and contamination control engineering ". Proven track record of infection control , both post surgical as well as Hospital acquired infections, leading to improved health care outcomes.

https://pneoterik.com/

Emys Bionics Pvt Ltd

Thrust areas are patient specific implants and post treatment rehabilitation. They are focusing on reconstruction in craniofacial region by 3D printing. They have ongoing research in creating novel composite materials for patient specific implants with improved tissue adhesion, biocompatibility and integration.

https://emysbionics.com/

Wrizto Healthcare Pvt Ltd

"WRIZTO" is a platform ecosystem that enables consumers to manage his/her and family health account (Medical and health data management facility). Further it provides an aggregate managed services from illness, fitness to Itllness.

http://www.wrizto.com/

Theranautilus Pvt Ltd

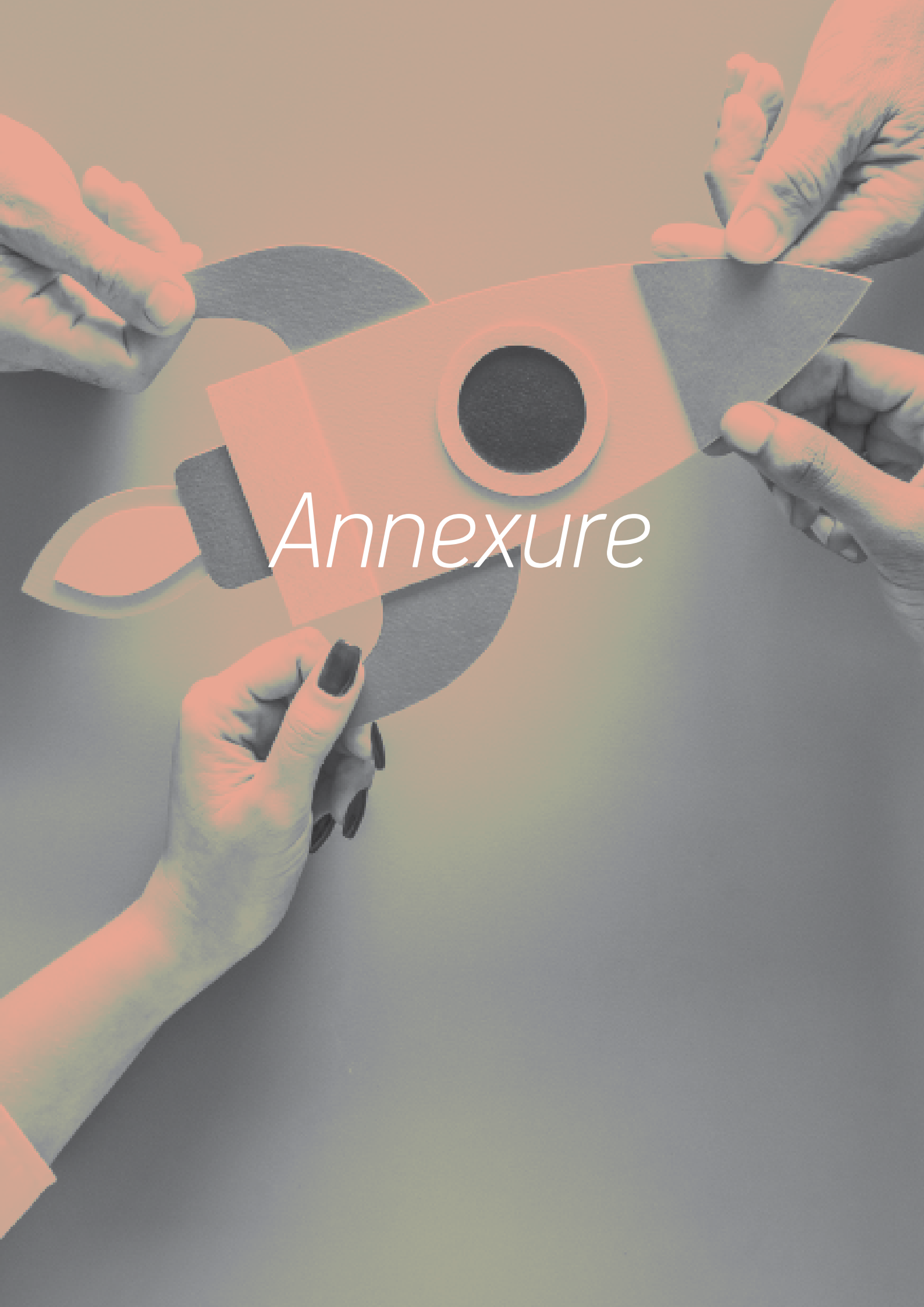
Indian private, deep-tech, nanotechnology and healthcare company. Theranautilus's device can be used to guide the nanorobots to their targets deep inside the dentinal tubules. Once the nanorobots reach the bacterial infestation site, they can be remotely activated to deploy their antibacterial mechanism. This novel solution minimizes root canal failure, which currently afflicts up to 14-16% of the millions of root canal treatment.

https://t3mgen.com/

Cosmos-Chozen Healthcare Pvt Ltd

Cosmos Chozen is an initiative focused on strengthening the nature of human correlation. It is to try building a society free from ailments with the help of integrative system of medicine (modern and traditional medicine).

https://t.co/6R342oAm4o?amp=1



Annexure

PRODUCTS LAUNCHED IN 2021-22

Product	SCALREOLIDE
Founder	Dr Chandrika
Company	Tojo Vikas
Category	Synthetic Biology
Launched	21-Sep 2021
Description	Sclareolide is a fermentation product of Sclareol and is key fragrance intermediate in the development of Amber notes. This is the first Company from India to develop this through synthetic Biology Approach

Product	VYVUZ
Founder	Dr Latha Damle
Company	Atrimed Biotech
Category	Herbal medicine
Launched	21-Sep 2021
Description	The product is a herbal supplement against COVID 19. The formulation showed 99.80% inhibition of the COVID 19 virus replication in Phase 2 clinical trial.

Product	FIBROSCAR GEL
Founder	Dr Vivek Mishra
Company	Fibroheal
Category	Medicinal
Launched	21-Sep 2021
Description	The product effective for skin scar management and moisturization.

Product	ENGINEERED ENZYMES
Founder	Mr Praveen
Company	K cat Enzymatic
Category	AI Healthcare
Launched	21-Sep 2021
Description	The Engineered enzymes includes Transaminase, Lipase, Ketoreductase, Nitrilase, Hydroxylase, Alcohol Reductase and Ene Reductase. These Industrially useful enzymes have been developed using 7D Grid Technology which is an Artificial Intelligence based enzyme engineering framework.

Product	SPIKE S1 PROTEIN AND PSEUDOVIRUS
Founder	Dr Rajanikant Vangala
Company	Neuome Technologies
Category	Diagnostics
Launched	21-Sep 2021
Description	The products can be used for COVID 19 detection. These products are imported currently and Indigenous production by Neuome will help in avoiding imports and developing our own capabilities in Research.

PRODUCTS LAUNCHED IN 2021-22

Product	Shieldex 24
Developer / Founder	Mr Ravi Kumar
Company	Biofi
Category	Medical Device
Announcement on	7-July
A UV-ROS box for COVID 19 sterilization. It is a device that can eliminate virus located on any object; ideal for applications in the transportation industry.	

Product	Florescence probes and PCR mix for RTPCR detection
Developer / Founder	Dr Govindarajan & Dr Meher Prakash
Company	VNIR
Category	Diagnostics
Announcement on	7-July
The probes are part of the Covid-19 test kits; the probes are currently imported. Without the probe, virus detection is not possible.	

Product	Remote foetal monitoring device- Daksh
Developer / Founder	Dr Arun Agrawal
Company	Janitri, Viral Transport Media- DeConto
Category	Medical Device
Announcement on	7-July
This is useful for Covid-19 positive pregnant women; the device helps remote monitoring of the foetus.	

Product	VTM
Developer / Founder	Mr Manjunatha and Mr Dinesh
Company	Deno Bio labs
Category	Medical Device
Announcement on	7-July
It helps in safely transporting the live virus sample from the sample collection centre to the testing lab.	

Product	Cov-Astra an AI-based device for detection
Developer/ Founder	Mr Adarsh Nararajan
Company	Aindra
Category	Diagnostics
Announcement on	7-July
A significant breakthrough that can detect Covid-19 virus through an x-ray; eliminates the conventional throat swab testing. Cost per detection is significantly lesser at INR 150-250 per person.	

Product	Anti-microbial face wash containing herbal antimicrobials
Developer / Founder	Dr Latha Damle
Company	Atrimed
Category	Medicinal
Announcement on	7-July
A herbal product that can kill any virus, including Covid-19 virus from any person's face within seconds.	

Product	Padma Vitals
Developer / Founder	Dr Madan Gopal
Company	Cardiac Design labs
Category	Diagnostics
Announcement on	6-August
Padma Vitals+ is a centralised monitoring system for ECG, respiration, Spo2 and body temperature, which can measure the vitals continuously and the analysis is sent through telemetry, with an alerting system embedded in it. The device is much needed for contactless monitoring of patients during Covid-19 Pandemic. The product has been validated at Narayana Hrudayalaya.	

Product	Malli's Cordytea
Developer / Founder	Dr Moushmi Mondal
Company	Mallipatra Nutraceuticals
Category	Nutrition
Announcement on	6-August
Cordytea is an immunity booster tea prepared from medicinal mushroom - Cordyceps. The mushroom variety grown under laboratory conditions is developed by the Innovator. Cordicepin, an active ingredient is known to have antiviral properties too. In the Covid-19 times, it will be helpful in boosting the immunity levels. The product has been patented and is approved by FSSAI.	

PRODUCTS LAUNCHED IN 2021-22

Product	CD4 Shield
Developer / Founder	Dr Vijay Lanka
Company	Stabicon
Category	Nutrition
Announcement on	6-August
CD4 Shield is a chewable tablet containing curcumin and Vitamin B12. Both the ingredients fight inflammation and infection. The product ensures activation of innate immunity by activating CD4+, CD8+ and IFN 1 to virus specific effect and has immunomodulatory properties. It also reduces cytokine storm in response to viral infection. The product is approved by FSSAI.	

Product	BeamRoti
Developer / Founder	Dr Srinivas
Company	Aspartika
Category	Nutrition
Announcement on	6-August
BeamRoti is an immunity booster chapati having mixture of herbs recommended by AYUSH Ministry. The ingredients have been prepared using supercritical fluid extraction technology to ensure optimum concentration of herbal extract reaches the body. The chapatis are easy to store with good shelf life and Patent application has been filed. The product is approved by FSSAI.	

Product	Immune booster daily drops
Developer / Founder	Dr Srinivas
Company	Aspartika
Category	Nutrition
Announcement on	6-August
An immunity booster drop approved by FSSAI, is a mixture of herbs recommended by AYUSH Ministry. The ingredients have been prepared using supercritical fluid extraction technology to ensure optimum concentration of herbal extract reaches the body by mixing just one drop of the product in a glass of hot water.	

Product	VegPhal - Fruit and vegetable sanitizer
Developer / Founder	Deepak Bhajantri
Company	Krimmi Biotech
Category	Medicinal
Announcement on	6-August
This sanitiser is prepared using edible ingredients effective against microbes and removal of pesticides. It is chlorine and alcohol free.	

Product	Water Sanitizer - Kitchen tap
Developer/ Founder	Ravi Kumar
Company	Biofi
Category	Medical Device
Announcement on	6-August
This is a miniaturized version of UV purifier that can be attached to a water tap and kill 99 per cent of microbes including viruses such as phages.	

Product	Antimicrobial HVAC module
Developer / Founder	Ravi Kumar
Company	Biofi
Category	Medical Device
Announcement on	6-August
A module that can be fitted to HVAC systems to ensure circulating air is sanitised. Especially useful during Covid-19 times as many enclosed spaces in which AC circulated air may be contaminated. Based on UV-silver titanium dioxide technology, the product is patented and validated.	

Product	NucleoDx RT
Developer / Founder	Dr Prabhakar Kulkarni
Company	NeoDx Biotech labs
Category	Diagnostics
Announcement on	9-September
It is a simple and cost effective method of RNA isolation to be used in RT PCR for detection of COVID 19. This is developed indigenously.	

Product	CoviDx mPlex 3R and 4R
Developer / Founder	Dr Prabhakar Kulkarni
Company	NeoDx Biotech labs
Category	Diagnostics
Announcement on	9-September
An in-vitro RT PCR qualitative assay for detection of COVID 19 virus utilizing three and four genes identification. This is sensitive assay, indigenously developed and has got ICMR and CDSCO approval for manufacturing.	

PRODUCTS LAUNCHED IN 2021-22

Product	Dr Tapaman
Developer / Founder	Dr Latha Damle
Company	Atrimed
Category	Medical Device
Announcement on	9-September
A device that measures body temperature as a symptom for COVID 19. Unlike similar device available in market, it does't have a trigger but a switch, lighter in weight and does not emit and radiation. User friendly and is developed entirely indigenous device.	

Product	SAFAE Biosecurity Solutions
Developer / Founder	Shri Gangadhar R
Company	KAPTRONICS
Category	Medical Device
Announcement on	9-September
The tunnel provides for automated temperature scanner, blood oxygen level check, mask detection, automated hand wash, complete disinfection of body, clothes and luggage, in addition to contact tracing of people within location of installation. It is completely developed indigenously and one of its kind in the country.	

Product	UVEE beamer
Developer / Founder	Mr Ravi Kumar
Company	Biofi
Category	Medical Device
Announcement on	9-September
The device eliminates germs by denaturing their DNA. The elimination of germs is effected within 30 seconds and is unmanned with 360 degree UV exposure.	

Product	UVEE conveyor
Developer / Founder	Mr Ravi Kumar
Company	Biofi
Category	Medical Device
Announcement on	9-September
The device is an enclosed moving belt with a UV- C system that kills germs on objects of varying sizes and will be mostly useful and big commercial spaces.	

Product	AI based Chain mobile app
Developer/ Founder	Ms Vishnupriya
Company	Aindra
Category	Aviana HV Bioscience Pvt Ltd
Announcement on	9-September
The product is developed by the Innovator Ms Vishnupriya from Aviana HV Bioscience Pvt Ltd in Collaboration with WNFT technologies PVT Ltd. This mobile app uses chest X-ray images and gives instant COVID positive or negative result.	

Product	RespirAID
Company	Biodesign Innovation Labs Private Limited
Category	Medical Device
Announcement on	9-September
RespirAID is a safe, reliable, portable, affordable alternative for prolonged manual ventilation that delivers intermittent positive pressure ventilation with essential ventilator parameters and provides automated respiratory assistance for patients. It can be used during emergency care, transport ventilation and post-operative anaesthesia.	

Product	Emvlio
Company	Blackfrog Technologies Private Limited
Category	Healthcare
Announcement on	9-September
A portable medical-grade refrigeration system for safe transport of biologicals like vaccines, blood, serums etc. that require strict temperature-control. The product is now being used by District Hospitals in Karnataka and TN for the transport of COVID-19 specimens (nasal & throat swabs) while ensuring the samples are not thermally-degraded or contaminated, thereby preventing risks of false-negatives arising during testing.	

Product	Doxper
Company	InformDS Technologies Private Limited
Category	Healthcare
Announcement on	9-September
AI powered digital pen and encoded paper solution which does not require any behaviour change from the doctor, nurse or assistant - no typing is required. The solution can be quickly deployed to all of the COVID-19 screening and testing centres (Fever Clinics, Serological Testing etc), to ensure that real-time, accurate data is digitised and flows to the right stakeholders for updates and analysis.	

PRODUCTS LAUNCHED IN 2021-22

Product	VAPCare
Company	InnAccel Technologies Private Limited
Category	Healthcare
Announcement on	9-September
VapCare is an automated secretion management and oral hygiene system for ICU patients on mechanical ventilation. VAPCare provides a completely closed system for intelligent and accurate removal of saliva and secretions in a ventilated patient- without any risk of exposure of the nurse to these secretions. VAPCare also significantly reduces the nursing burden by automating a key nursing step in the management of ventilated patients- which will also be critical in the impending shortages of nursing staff with increased ICU admissions for COVID.	

Product	Dozee
Company	Turtle Shell Technologies Private Limited
Category	Healthcare
Announcement on	9-September
India's only contactless health monitor. A thin sensor sheet that goes below the mattress and monitors heartbeat, respiration, oxygen saturation and sends information to doctors remotely. Without any wires, patients can be continuously monitored. Nurses need not physically visit patients to check health vitals, hence reducing their exposure to infection and workload. Doctors can also put custom alerts on each patient to identify if the condition is deteriorating, and hence can timely transfer them to ICU. This is being used in 20+ hospitals and covid centres in remotely monitoring patients. Also in monitoring thousands of patients at home, increasing India's bed capacity. Dozee has proven life-saving in 47 cases already.	

Product	VideoBot
Company	CoRover Private Limited
Category	AI Healthcare
Announcement on	9-September
CoRover Private Limited has invented a world first AI-based Doctor VideoBot addressing to the queries about COVID-19 disease transmission and contagion control supported with multi-lingual voice and text formats. AskDoc provides its users with an auto and quick response to any queries about the Coronavirus, along with the safety measures to be followed as per the MHFW, Government of India and WHO guidelines.	

Product	Stasis
Company	Stasis Health Private Limited
Category	IoT Medical Devices
Announcement on	9-September
Made-in-India, USFDA-cleared Remote Patient Monitoring (RPM) solution that converts any bed into cloud-connected in any care setting within minutes. Their smart, continuous, remote monitoring solution is easy to install and very simple to use, needs NO additional infrastructure, and can be deployed in all areas of the hospital including general wards, private rooms, isolation rooms, transplant units, post-operative areas, HDUs, step-down units and even the ICU.	

Product	FACE SHIELDS, SAFETY KEY
Company	Printalytix Private Limited
Category	Manufacturing
Announcement on	9-September
FACE SHIELDS – which can protect public, healthcare heroes from getting infected by COVID-19 virus. COVID SAFETY KEY - Their safety keys to handle multiple objects in our daily life such that any person using the keys need not touch surfaces of objects such as door handles, gates etc. & can protect themselves from getting infected. INTUBATION BOXES – which are used in COVID-19 hospitals by doctors while treating patients such that aerosols which contain virus do not come in contact with healthcare staff & protect them from getting infected.	

Product	Hylobiz
Company	HYLO Challenger Private Limited
Category	Fintech
Announcement on	9-September
Hylobiz - digitising receivables | payables and working capital for SMEs - Post COVID, SMEs value chain is badly disturbed on their cash flows and working capital. Moreover, physical cash and cheque collections is no more comfortable or safe. hylobiz digitises the whole process of sending invoices, automated reminders, collections / payments, automated reconciliations, working capital possibilities from Banks/ NBFCs, insurance services through a single window platform. It would help the SME value chain which is the core of any country's economy to bounce back sooner.	

PRODUCTS LAUNCHED IN 2021-22

Product	Thermoxy
Company	Creintors Automation Solutions Pvt. Ltd.
Category	Product Design and Manufacturing
Announcement on	9-September
Thermoxy is specifically designed to measure the human body parameters like temperature, pulse rate and oxygen level and display each parameter on the device screen. The real time data such is transferred to the network by both wireless or through LAN. They have also given options for adding any intelligence tools using the data collected.	

Product	Qonch
Company	Agamin Innovations Private Limited
Category	IT/ITES
Announcement on	9-September
An IOT based platform with smart ID card holder which makes businesses, schools, colleges and university to re-open with confidence and implement social distancing norms on real time and contact trace in case of any breakouts. In addition to specific use case the platform also allows to manage attendance, geo-fencing, crowed management asset management etc.	

Product	SenseGiz
Company	SenseGiz Technologies Private Limited
Category	IT/ITES
Announcement on	9-September
An award winning & patent pending digital solution for enforcing social distancing and contact tracking for enterprise use: to mitigate risks, keep employees safe and prevent future business shutdowns due to COVID-19. Our solution also helps enforce geo-fencing for specified areas & prevents overcrowding. It can give instant audible alerts to individual employees carrying tiny tags if they break social distancing norms as well as give detailed reports with timestamps to admins.	

Product	Nubewell Network Function Gateway
Company	Nubewell Networks Private Limited
Category	Cyber-Security
Announcement on	9-September
Fake News Filtering at the Enterprise and Service Provider Level. Their SDWAN solution offers optimal traffic steering with predictable application performance combined with Smart Generation security features with Real Time Full Visibility and seamless Integration with third party vendors. Blocking all the Chinese Application in the ISP level. WFH (Work From Home) users are benefitted with Nubewell All In One simplified pizza box to prioritise video streaming application, collaboration tools such as WebEx, Microsoft Teams , Goggle Video, Corporate Applications such as Citrix, SAP, Oracle ERP and Cloud Appss such as Office 365 , SAP Cloud , Oracle cloud, Corporate VPN etc.	

Product	Letstart
Company	AMPWORK Private Limited
Category	IoT Medical Devices
Announcement on	IT/ITES
A platform where Business, Governance, People and Health Care, work together to help government to UNDERSTAND, MONITOR and EVALUATE the current situation. They have already built a platform where People, Businesses and Administration uses the platform where verified businesses supply daily needs to the people. Used by Kodagu District and Dharwad District.	

Product	Pixuate
Company	Cocoslabs Innovative Solutions Pvt. Ltd.
Category	IT/ITES
Announcement on	9-September
An AI based software which uses a thermal camera when placed at the entrance of public places, can detect body temperature of people entering the premise, without stopping them. This is done at a safe distance of 3-5 meters. Also, the temperature reading of everyone is recorded by the software, and real-time alarm is given if someone with high temperature walks in.	

Product	Touchless Mobile Attendance System		
Company	Touchless ID Private Limited	Category	IT/ITES
Announcement on	9-September		
Touchless ID replaces HW scanners. We use the mobile phone camera to take a picture of your fingers and extract fingerprint biometrics. These biometrics are compatible with Govt. databases like Aadhaar and so on. The single biggest cause of disease transmission is based on what we touch, the germs we leave behind and the germs we pick up from what other people have touched. During these times, we won't allow our loved ones to touch a HW scanner as the scanner could become the very epicenter for the spread of disease. Our product eliminates the "touch" in the attendance system.			

FDI & EXPORTS SIZE

FDI Equity Inflows to Karnataka

Year	FDI ($ Mn)	FDI (Rs Cr)
2019-20	311	2,190
2020-21	1,341	9,914
2021-22*	503	3,729

Year	FDI ($ Mn)	FDI (Rs Cr)
2019-20	103	723
2020-21	429	3,172
2021-22*	171	1,268

The FDI in Biotech arena has seen significant rise in FY2020-21. The investment has largely been in the area of Vaccines, testing, and new anti-infectives. The FDI investments grew from $311 million in 2019 to $1.34 billion in 2020-21. The total investments in the country in FY 2021-22 till September 2021 grew to $503 million. Karnataka has also attracted good FDI during the last two years. The FDI in FY2020-21 in Karnataka was $429 million. This is almost 318 percent growth compared to the previous fiscal. The FDI in the first six months has been robust and the sector in Karnataka attracted $171 million. The early projections estimate the FDI in FY2021-22 to end at around $550-600 million.

KARNATAKA'S EXPORTS

Revenue from Karnataka's exports in FY2020-21 registered 6 percent growth to record $2.9 billion in revenue. The impact was due to the pandemic economics. BioPharmaceuticals, drug research and delivery services along with BioIT and health services continued to push exports from Karnataka. The Biopharma exports driven by the insulin and infectives recorded $1500 million in revenues. The Drug discovery and research, clinical management services along with digital heath accounted for another $1100 million Marine exports touched $200 million, while enzymes and other products touched $100 million in sales. The Exports revenues in FY2021-22 are encouraging. The sector is likely to register 18% growth and by March 2022, the sector is projected to record $3.5 billion in sales.

Year	BT Exports Revenues (Rs. Cr)	BT Exports Revenues ($Bn)
2019-20	20,227	2.81
2020-21	22,112	2.98
2021-22*	19,548	2.64
2021-22**	26,064	3.52

**Projected till September end* ***Projected full year*

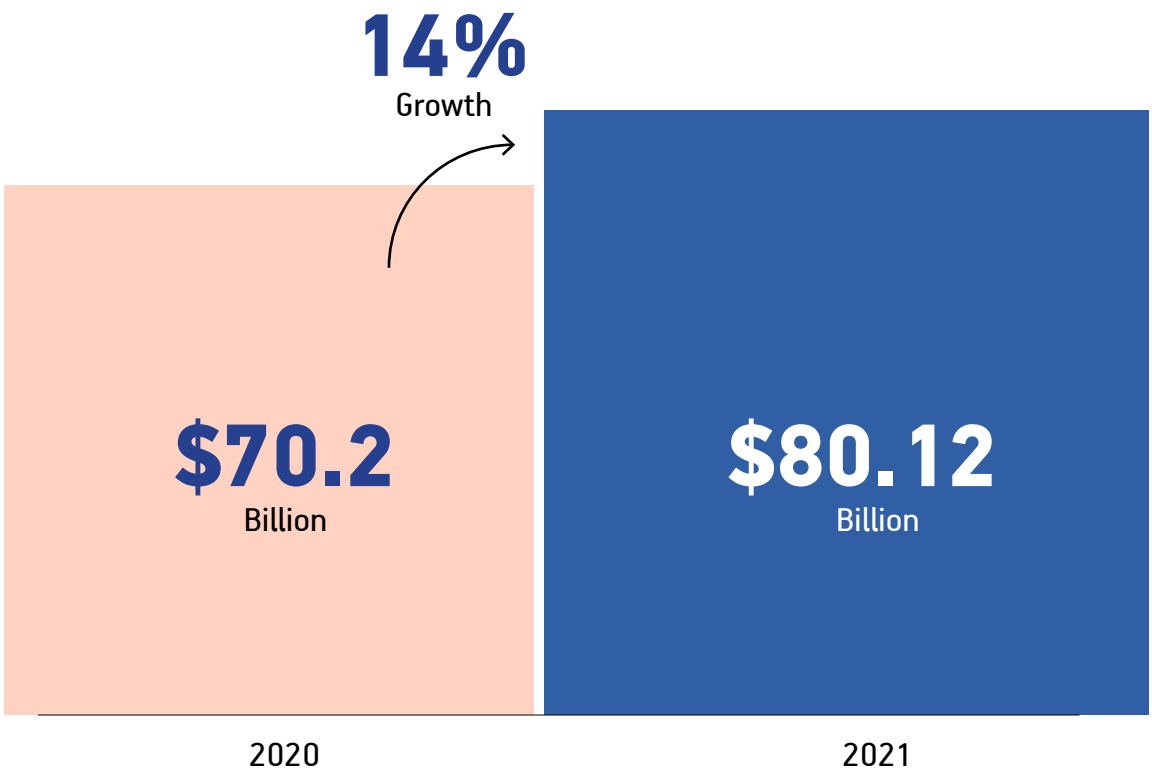
The biotech exports in FY2019-20 accounted for nearly 54% share of the total biotech revenues of Karnataka

The biotech exports in FY2019-20 accounted for nearly 54% share of the total biotech revenues of Karnataka. The share of the exports in FY21-22 is likely to be in the 52-55% range. The revenue from domestic manufacturing and services is on the rise. The share of revenues from domestic sales is reaching the 48% range from the earlier 40-45% range. Covid-based testing and vaccination has been biggest driver of domestic sales and services. This sector alone contributed to nearly $400 million in revenues in the first nine months of FY 2021-22.

INDIAN BIOECONOMY, DECEMBER 2021

This IBER report now has been the guiding force for a host of national policies, regulations, and directives set out to reach ambitious target of $100 billion BioEconomy by 2025. Further, several states have begun to model their respective Biotechnology sectoral thrusts based on the national Indian BioEconomy Report (IBER).

BioEconomy 2020 VS 2021



The Indian BioEconomy for 2021 (January-December 2021) is estimated at $80.12 billion. The BioEconomy registered 14% growth over 2020. Indian BioEconomy is continued to nearly account for 2.6percent share of India's GDP in 2021. India's BioEconomy continued to perform well during the pandemic years as the BioPharma segment responded to the vaccine and testing needs in India.

"Karnataka continues to lead in innovation and technology with a series of initiatives for all round development, leveraging the talent and skills available across the state in biotechnology, information technology and nanotechnology. The unprecedented challenges forced by the COVID-19 pandemic has increased our efforts to lessen the suffering of people through biotechnology tools.

Dr EV Ramana Reddy, IAS,
Additional Chief Secretary (ACS), Department of Electronics, IT, BT, and S&T

"The double-digit share of BioEconomy's contribution to Karnataka's Gross State Domestic Product (GSDP) indicates that biotechnology will continue to play a key role in propelling the state's economic growth in the next few decades. KBER is an attempt to capture the tremendous efforts that have gone into making Karnataka one of India's most sought-after biotechnology hub."

Smt Meena Nagaraj CN, IAS,
Managing Director, Karnataka Innovation and Technology Society (KITS) and Director, Department of Electronics, IT, BT, and S&T

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LINKS TO SOME REFERENCE WEBSITES SOURCE

http://pharmapathway.com/
http://wgbis.ces.iisc.ernet.in/
http://www.aurumequity.com/
http://www.bioinnovationcentre.com/
http://www.cottonguide.org/
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