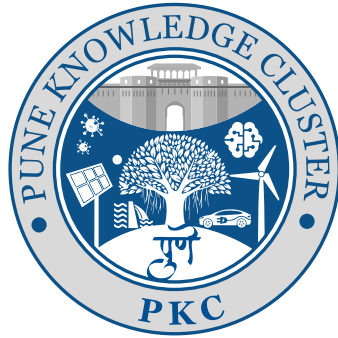




SCIENCE &amp; TECHNOLOGY CLUSTER





## **PUNE KNOWLEDGE CLUSTER**

**IMPACT REPORT  
2020-2022**





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## VISION & MISSION

Pune Knowledge Cluster is established by the Office of the Principal Scientific Adviser, GoI (PSA) and hosted by Inter - University Centre for Astronomy and Astrophysics, Pune (IUCAA).

The O/o PSA aims to provide pragmatic and objective advice to the Prime Minister and cabinet on matters related to science, technology and innovation with a focus on application of science and technology in critical infrastructure, economic and social sectors in partnership with Government departments, institutions and industry.

IUCAA is an autonomous institution set up by the University Grants Commission (UGC) of India to promote the nucleation and growth of active groups in astronomy and astrophysics at Indian universities. IUCAA aims to be a centre of excellence within the university sector for teaching, research and development in astronomy and astrophysics.

### Vision

The Pune Knowledge Cluster (PKC) aims to bring together academia, R & D institutions and the Industry of Pune and its surrounding areas, to address challenging problems of the region through innovative means, using scientific knowledge and engaging highly skilled human resources.

### Mission

To act as a catalyst to bring together the large talent pool present in Industry, Academia, Government and non-Governmental organizations of Pune to brainstorm, discuss and identify projects of importance and of value to the region and to execute them through collaborative efforts.



## PUNE KNOWLEDGE CLUSTER LEADERSHIP



**Prof. Ajit Kembhavi**  
Principal Investigator



**Prof. L. S. Shashidhara**  
Co-Principal Investigator



**Prof. Somak Raychaudhury**  
Director, IUCAA



**Dr. Priya Nagaraj**  
Chief Operating Officer



**Ms. Anita Kane**  
Senior Advisor



**Ms. Rashmi Urdhwareshe**  
Senior Advisor



**Prof. Ninan Sajeeth Philip**  
Senior Advisor

## PUNE KNOWLEDGE CLUSTER ADVISORY COMMITTEE



**Prof. R. A. Mashelkar**, FRS  
Chairman, Advisory Committee  
Former Director - General, CSIR



**Prof. Somak Raychaudhuri**  
Director,  
IUCAA



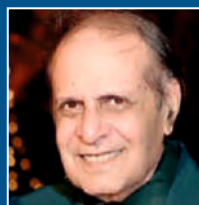
**Dr. Hemant Darbari**  
Mission Director,  
National Supercomputing Mission



**Dr. Pramod Chaudhuri**  
Chairman,  
Praj Industries



**Dr. Anand Deshpande**  
Chairman,  
Persistent Systems Ltd



**Mr. Arun Firodia**  
Chairman,  
Kinetic Group



**Dr. Naushad Forbes**  
Co - Chairman,  
Forbes - Marshall



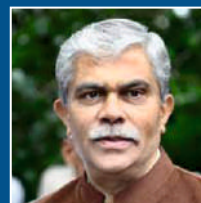
**Dr. Baba Kalyani**  
Chairman,  
Bharat Forge (PSA's Nominee)



# PUNE KNOWLEDGE CLUSTER ADVISORY COMMITTEE



**Lt. Gen. Dr. Madhuri Kanitkar (Retd)**  
Vice Chancellor,  
MUoHS



**Prof. Nitin Karmalkar**  
Former - Vice Chancellor  
SPPU



**Mr. Dinanath Kholkar**  
Vice - President & Global Head  
of Analytics and Insights, TCS



**Ms. Pratima Kirloskar**  
Kirloskar Brothers



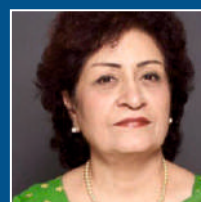
**Mr. Sudhir Mehta**  
CMD, Pinnacle Industries,  
President, MCCIA



**Dr. Arabinda Mitra**  
Former Scientific Secretary,  
Office of the PSA



**Mr. Ravi Pandit**  
Chairman,  
KPIT Technologies



**Ms. Lila Poonawala**  
Chairperson, LPF  
Former CMD Alfa Laval & Tetrapak

## PUNE KNOWLEDGE CLUSTER ADVISORY COMMITTEE



**Dr. V. Premnath**  
Director,  
Venture Centre



**Prof. Jayant Udgaonkar**  
Director,  
IISER Pune



**Prof. Ajit Kembhavi**  
Principal Investigator - PKC ,  
Professor Emeritus, IUCAA  
Ex-Director, IUCAA



**Prof. L. S. Shashidhara**  
Co-Principal Investigator, PKC  
Dean of Research, Prof. Biology,  
Ashoka University  
Prof. Biology, IISER Pune

## LEADERSHIP PERSPECTIVES



**Prof. Ajit Kembhavi**

Principal Investigator, Pune Knowledge Cluster

**Prof. L.S. Shashidhara**

Co-Principal Investigator, Pune Knowledge Cluster

**Dr. R. A. Mashelkar, FRS**

Chairman, Advisory Committee, Pune Knowledge Cluster

**Prof. Somak Raychaudhury**

Director, IUCAA (Host Institution of PKC)

**Dr. Priya Nagaraj**

Chief Operating Officer, Pune Knowledge Cluster





**Prof. Ajit Kembhavi**  
Principal Investigator,  
Pune Knowledge Cluster



**Prof. L.S. Shashidhara**  
Co-Principal Investigator,  
Pune Knowledge Cluster

The idea of setting up a knowledge cluster in the Pune region was conceived in late 2018; at that time the objective was simply to bring together various institutions in Pune to a common platform for interdisciplinary projects and capacity building. But discussions with the then Principal Scientific Advisor (PSA) to the Government of India, Professor K. Vijayraghavan and his colleagues led to the idea of a knowledge cluster much broader in its scope with participation by institutions as well as other organisations. The first discussion meeting regarding the cluster was held in January 2019. That was followed by a few town hall meetings called by the PSA and the then Scientific Secretary at the PSA's Office Dr. Arabinda Mitra. From these meetings the idea emerged of a Pune Knowledge Cluster (PKC) of academic institutions, R&D organisations, industries, NGOs and civic and governmental bodies to work together to address some of the problems faced by the city and the surrounding regions, in a knowledge based and data driven manner. A proposal was made to the PSA's office for support for the PKC and approval was received in February 2020, just at the beginning of the pandemic.

The first problems to be addressed by the PKC, even before the formal beginning of the cluster in August 2020, were issues related to the pandemic, which are described in this impact report.

The verticals of interest to the PKC are health, sustainability & environment, sustainable mobility, Big data & AI, and capacity building. In these verticals our focus has always been on those projects which require multi-disciplinary and multi-institutional participation for providing long-term and sustainable solutions to the city's problems. To define projects and for their implementation, we initiate a series of brainstorming meetings with diverse sets of experts in each vertical and we seek funding for them from government agencies, foundations and CSR initiatives of the industry. Several projects have been initiated in this manner and others are in advanced stages of finalisation. We have already demonstrated our ability to manage city-wide and multi-institutional projects, as the stories in this impact report will show, thus fulfilling to some extent at least, an important mandate of our cluster. We have also contributed substantially to capacity building among the youth in city and a wider region.

In the two years of its existence the PKC has grown into a dynamic organisation with a staff of about 25 very talented, dedicated and hardworking people, who convert ideas to reality. We have received help from every organisation that we have approached, and funds from the PSA's office as well as a number of other sources. We have also been inspired and guided by a host of distinguished individuals in the city and beyond, and our Advisory Committee. Without all that support, our ideas would have still remained on paper. For the two of us this has been a wonderful journey, not easy and often out of our own comfort zones, but always immensely enriching and fulfilling.



**Dr. R. A. Mashelkar**  
FRS,  
Chairman, Advisory Committee,  
Pune Knowledge Cluster

I have been the chairman of the Advisory Council of Pune Knowledge Cluster (PKC) for two years now. I would consider PKC as a highly successful S&T cluster, almost an exemplar. There are five reasons for my making this statement.

First, it has done something that was much needed, but was not achieved in the city of Pune. That is to bring together not only Academia, R & D institutions and the industry, but also all other stakeholders, like NGOs, the civic bodies and so on, and like never before. The Office of the Principal Scientific Adviser, Govt. of India, deserves a loud applause for this initiative.

Second, Knowledge Clusters can't be just clustering knowledge, they must go beyond knowledge and facilitate converting knowledge into wealth and social good. It is not the power of ideas, but the power of execution that matters. That means action that brings together both generators of knowledge but also the users. PKC has followed an end to end approach, helping move from ideas to impact, in multiple activities that it has undertaken. Their partnering with civic bodies like Pune Municipal Corporation, Pune Zilla Parishad, R&D organizations, hospitals, etc is a case in point.

Third, PKC has focussed on problems that 'need' to be solved rather than those that 'can' be solved. In other words, focusing on the 'need' of the hour. For instance, during the pandemic PKC rose magnificently with great projects that aligned itself with Integrated Disease Surveillance Project and contributed through sero-survey, genomic and environmental surveillance, long term immunogenicity studies, etc.

Fourth, PKC has done the magic of MLM, meaning More from Less for More, a term that I had coined in 2008, while proposing the concept of Gandhian Engineering. This means getting 'more' output from 'less' resources for impact on the lives of 'more' and more people. PKC has spent just Rs 3 CR in two years, but managed to forge 60 national and international partnerships and raise Rs 5 CR plus of their own funding to support their projects. This is a brilliant example of the trust and confidence that PKC has been able to win.

Fifth is the visionary leadership, which has admirably leveraged talent, technology and trust. At present, 80% of the PKC team comprises women. The CEO and two out of three Senior Advisors are women. This is inclusion of the highest order.

These are the five reasons that have given me the confidence to say that PKC is an exemplar. Some of the lessons learnt and models developed at PKC could be followed by other Knowledge Clusters.



**Prof. Somak Raychaudhury**  
**Director, IUCAA**  
**(Host Institution of PKC)**

I am very happy that the Pune Knowledge Cluster, in its first two years, has achieved its current form and extent, and has already established itself as an important operation, to bring together the skills and talent available in the academic and research institutions and in industry in the greater Pune area, in order to tackle the important ongoing and emerging problems of the region. I feel privileged that my institution, the Inter-University Centre for Astronomy and Astrophysics (IUCAA) was chosen, by the office of the Principal Scientific Advisor to the Government of India, to host this cluster at its inception.

It was very exciting to see the cluster take shape in its early days, with various participants and possible stakeholders coming together in various groups to explore how this novel concept might help enhance synergies inherent in their activities. IUCAA, with its long history of local collaborations between academia and industry and inter-disciplinary and international academic research, was a natural locus for these discussions.

These two years after the cluster was formally started have been dominated by the challenges posed by the COVID-19 pandemic and its associated exigencies. However, the adversities brought together the various partners in many unprecedented ways. PKC and IUCAA members played a very important role in these activities, working with industry and local government, enhancing and facilitating the various efforts which have now led to singular achievements far beyond the initially planned public health and disease related exercises.

At the two-year mark, the Pune Knowledge Cluster has actively collaborated with research groups and industry and raised external funding from national and international sources. Substantial work has commenced in all the focus areas of public health, environment, sustainable mobility, data analytics and capacity building, and I am very happy to see that academic institutions, including IUCAA, and industry are participating in equal measure. An underlying theme in all the research areas is the application of artificial intelligence-driven data handling initiatives, which is powered by one of the strong areas of activity and expertise in the Pune region. Our dream is to reinforce the skills training programmes, and to involve academia and industry in improving the long-term living conditions of the citizens of the region, in a way that the catalysis that the cluster offers adds up to much more than the sum of its parts.





**Dr. Priya Nagaraj**  
Chief Operating Officer,  
Pune Knowledge Cluster

The City Knowledge and Innovation Cluster initiative by the Office of Principal Scientific Adviser, GoI is a nascent project in India. While focused ecosystems have existed for many years, the idea that organized cluster thinking can significantly influence growth strategies and enhance quality of life in a city (going forward state and nation) is being explored for the first time at the national level through Knowledge and Innovation Clusters like the Pune Knowledge Cluster.

PKC, over the past 2 years has stayed true to its mandate by enabling meaningful and fruitful partnerships between diverse stakeholders, all working towards a common goal – leveraging S&T capabilities of institutions and individuals to work for the betterment of Pune city. Most of PKC's initiatives have been initiated and implemented through a participatory and consortium approach. Organizations that are part of these consortiums have achieved much more than what they could have achieved individually, by pooling their infrastructural and intellectual resources.

PKC was incepted during the pandemic which dictated the way we worked for a good part of two years. The pandemic also proved that when organizations agree to collaborate and work together, their people find ways to reframe challenges as opportunities. PKC leveraged this to build strong knowledge and innovation networks in the city. In order for us to sustain these efforts, we require the support of various stakeholders who see value in contributing to building a robust cluster ecosystem.

I am grateful for the commitment and resilience shown by the founding team who pushed through tumultuous times to uphold PKC's mission and lay the foundation for our organization to achieve scaled outcomes. The impact and achievements highlighted in this report are a testament to their hard work. This report intends to give you a glimpse of PKC's journey so far.

## PKC AT A GLANCE



**29** National Collaborations  
**3** International Collaborations



**73**  
Workshops/ Webinars/ Training Programs



**5,733**  
Beneficiaries



**INR 5+ Cr**  
Funds Raised



**8**  
Funded Projects

## Executive Summary

The Office of the Principal Scientific Adviser (PSA) to the Government of India has established Science & Technology (S&T) clusters in various cities in India. Their purpose is to bring together academic institutions, research and development (R&D) laboratories, industry and local administration to address challenging problems of the city and region where the cluster is located. The clusters were set up on recommendation by the Prime Minister's Science, Technology and Innovation Advisory Council (PM-STIAC), and are guided by a Cluster Apex Committee, chaired by the Vice-Chairman, NITI Aayog. The first set of clusters has been established in six cities of India, namely Bengaluru, Bhubaneswar, Delhi, Hyderabad, Jodhpur, and Pune.

Pune Knowledge Cluster was established in August 2020. Pune was chosen for establishing a cluster because of the many academic institutions, R&D labs and knowledge-based industries present in the Pune Metropolitan Region (PMR, which is larger than the region covered by the Pune Municipal Corporation, PMC) and surrounding areas, which together constitute the Pune region.

The PKC is currently administered by the Inter-University Centre for Astronomy and Astrophysics (IUCAA) and is on its way to becoming a Section 8 Company. It has its office on the campus of S. P. Pune University. It has a small staff including a Chief Operating Officer, Senior Advisors, Program Managers, Assistant Program Managers and scientific and technical experts working on specific projects. The PKC has an Advisory Committee consisting of eminent scientists, technologists, industrialists and heads of institutions. Funds for the operation of the PKC and seed funding for projects are provided by the O/o PSA, while the main funds for projects are obtained from CSR programmes of companies, foundations and other funding agencies.

The objectives defined by O/o PSA for S&T clusters in India include the following

- Building of a shared ecosystem in the region
- Becoming a regional solution provider
- Becoming nationally and globally competitive



### Objectives of the S & T Clusters

(Pic Credit : <https://www.psa.gov.in/st-clusters>)



Pune Knowledge Cluster has been systematically working towards these objectives since its inception under the following verticals:

- Health
- Sustainability and Environment
- Sustainable Mobility
- Big Data and AI
- Capacity Building

### **Building of a shared ecosystem in the region**

Pune city is a hub of premier national level research institutions and innovation driven industries working in frontier areas of IT, health, environment, manufacturing, automotive etc. PKC has built a conducive ecosystem for various types of organizations to engage and collaborate for projects that have and will continue to benefit the city. PKC has worked with 60 partner organizations and has MoUs/MoAs with 30 of them including research and academic institutions, industries, societies and associations, NGOs, civic bodies and incubation centers.

### **Becoming a regional solution provider**

PKC has remained focused on programs involving citizens and civic bodies to address problems which have local relevance. These include programs like city level surveillance of COVID-19 during the pandemic, programs for enhancing the tree cover in the city and introducing technology-based teaching and learning methods in government schools. PKC has developed and launched 2 platforms to encourage citizens to participate and contribute to scientific data collection and curation. PKC has also served as a knowledge partner for the Pune Zilla Parishad, where it has facilitated technology feasibility studies for community biogas plants, creation of water management plans for water stressed villages etc. and has conducted a large STEM program for teachers of Zilla Parishad schools.

### **Becoming nationally and globally competitive**

The work done by Pune Knowledge Cluster on various regional issues has been carefully mapped to the objectives of various National Missions to foster local and national capabilities. Moreover, the solutions for the local problems have been carefully designed so that they take India a few steps further towards achieving targets of the United Nations 2030 Agenda for Sustainable Development with the help of national and international collaborations. PKC's ongoing projects across verticals align with 8 UN Sustainable Development Goals and 17 National Missions.

In October 2022, PKC signed an agreement with Water Valley, Denmark, which is a water cluster to collaboratively work on enabling innovation and adoption of water technologies. PKC's COVID-19 projects are also part of a bigger national initiative implemented in three cities in India.

### **Funding Partnerships**

PKC is supported with funds by the Office of the PSA for operational expenses and seed grants for initiating projects. The cluster has also raised additional project funds worth INR 5CR+ from various national and international agencies through CSR programs, foundation grants etc. The PSA's office has proactively helped in such fund raising, systematically connecting the cluster to potential donors.

## PROJECTS

### I. Health

PKC's Health vertical has collaborations across academic and industry, NGOs and Govt departments in generating data critical for public health decisions such as sero-surveys, clinical, immunological, and environmental surveillance and creating an epidemiological database with comprehensive health information for Pune and access to real-time data. During the pandemic, PKC managed five COVID-19 projects in the city in collaboration with 10 partner organizations including research institutes, hospitals, pathology labs and government bodies.

Projects include

- COVID-19 Sero-survey, COVID-19 Genomic Surveillance, COVID-19 Environmental Surveillance, COVID-19 Data Collection and Analysis
- COVID-19 Long Term Immunogenicity Study
- COVID-19 Clinical Database

### II. Sustainability & Environment

With the core emphasis on sustainability and climate action, Pune Knowledge Cluster supports India's commitment to the 2030 Agenda, by performing status quo assessments, developing monitoring systems and implementing sustainable solutions for environmental issues at a regional level. PKC's Sustainability and Environment vertical currently has three priorities:

- Programs for sustainable increase of vegetation cover in Pune Metropolitan Region
- Programs Monitoring the Environmental Evaluations
- Policy Advocacy - Water Action Plan for PMR and National Biomass Policy

### III. Sustainable Mobility

PKC's Sustainable Mobility vertical aims to apply scientific and technical tools to address the rapidly growing and changing mobility requirements of the city. We wish to support the development of sustainable solutions toward carbon-neutral transportation. Working towards the Smart City Mission of GoI, the Pune City administration is encouraging and enabling sustainable modes of mobility

Current focus areas include:

- Vehicular E-Waste Recycling-Projects are being conceptualized with technology providers and the auto industry to pilot novel technologies for vehicle E-waste recycling at the city level through public-private partnership models.
- Contributing to policy making for adoption of alternate (green) modes of transport

### IV. BIG Data & Artificial Intelligence

This vertical enables the development of various AI-driven platforms for basic and applied research. Large-scale citizen science programs are being developed to involve citizens in analyzing BIG scientific data to foster scientific temper. One such program is called One-Million Galaxies where 1000+ citizens have analyzed over 25 GB of data (images of galaxies) on PKC's platform. PKC is also building collaborative projects between BIG Data and AI experts, chemists, and biologists to encourage inter-disciplinary skilling and research through an AI Platform for Biology and Chemistry.

### V. Capacity Building

The capacity-building vertical of PKC aims to provide new opportunities to students, young researchers, and professionals to improve their knowledge base and acquire advanced skills through the following programs:

- Interdisciplinary Training Programs & Courses: Contemporary skill-building and knowledge enhancement
- Citizen centric science talks by experts
- STEM Education

PKC has conducted over 14 workshops and courses benefiting over 3000 stakeholders.

PKC's STEM education vertical focuses on promoting STEM education through technology-enabled training programs for school teachers and students, scholarship programs for women in STEM, gamification of learning, and setting up of STEM Labs.

## CONCLUDING REMARKS

We have summarized above some key elements and projects of the PKC. Those are all described in greater detail in the following pages of the report. Most of our projects are multidimensional and interdisciplinary; they involve collaboration between a number of people and organisations and their common aim is to bring benefits to society. It is hard to convey through the written word alone the excitement that is felt in working on the projects and taking them towards completion. Hopefully the reader will get a flavour at least of PKC's journey over the past 2 years.

## PARTNER PERSPECTIVES

**Dr. Pramod Chaudhari**

Founder - Chairman, Praj Industries Pvt Ltd

**Dr. Sanjay Juvekar**

Vadu Rural Health Program, KEM Hospital Research Centre, Pune

**Lt. Gen. Dr. Madhuri Kanitkar (Retd)**

Vice Chancellor, Maharashtra University of Health Sciences

**Mr. Sanjay Kolte, IAS**

Chief Executive Officer, Pune Smart City Development Corporation Ltd.

**Dr. Satyajit Mayor**

Chairperson, (BLiSC), Centre Director, NCBS-TIFR

**Ms. Sanskriti Menon**

Senior Programme Director, Centre for Environment Education, Pune

**Dr. Nikhil Phadke**

Founder - Director, Chief Scientific Officer, GenePath Diagnostics

**Dr. Sapna Poti**

Director, Strategic Alliances Division, The Office of PSA, GoI

**Mr. Ayush Prasad, IAS**

CEO, Pune Zilla Parishad





**Dr. Pramod Chaudhari**  
**Founder - Chairman**  
**Praj Industries Pvt Ltd**

At the outset I wish to compliment office bearers and staff of Pune Knowledge Cluster (PKC) on successful completion of two years of existence. As a member of the Advisory Committee from the very inception I have been watching PKC's evolution from close quarters and I do wish to record my sincere appreciation of various initiatives and progress therein. True to its vision PKC is able to galvanise academia, R&D institutions, Industry to address important challenges using science and technology platforms.

It is heartening to note that within a two year time frame, PKC is able to build partnerships with 60 organizations in India and abroad in priority areas of health, sustainability & environment, Big Data & AI, sustainable mobility and Capability Building. I am impressed to note that PKC has also been able to mobilize funding of Rs.5 Cores by way of grants and CSR funding from corporates to support various projects.

I admire PKC's contributions during COVID period in generating data critical for public health decisions and ongoing endeavours in compiling comprehensive health information for Pune and facilitate access to real-time data. We are witnessing ill-effects of climate change on humanity and I feel reassured that PKC has initiated concrete steps to establish biodiversity, taking firm steps aimed at carbon sequestration and biomass generation. Importance of water as a precious resource need not be overemphasised and I am glad that aligned with National Water Mission, PKC is developing a sustainable water Management Plan for the Pune district.

I noted that to harness the true potential of big data and AI, PKC has teamed up with experts to build collaborative interdisciplinary research projects. I laud PKC's work in the area of capacity building that is aligned with Skill India Mission and National Education Policy. This will go a long way in leveraging demographic dividend – nation's competitive advantage.

Recognizing that decarbonization of the transportation sector has a big role to play in the fight against climate change, our company Praj is working closely with PKC. We are actively participating in national and international symposiums organised by PKC to create awareness about sustainable climate actions amongst stakeholders and foster partnerships.

Our Bio-Mobility platform of technologies for production of low carbon biofuels is very well received as a part of the sustainable mobility initiative of PKC. Bio-Mobility has synergies with PKC's overarching objective of sustainable development and is recognized as socio-economic-environmental growth enablers for the nation. Praj is associated with PKC on various strategic projects such as encouraging community biogas projects in Pune, biomass/energy crop cultivation on barren lands, etc. Giving complementary strength, I am certain that these initiatives will fructify in a big way.

Demographic dividend is India's cutting edge in the global economy and to leverage its full potential we need to arm our talent pool with contemporary knowledge and skills. I have a strong conviction that technology has the prowess to change the world for the better and create meaningful employment opportunities. In this regard, I endorse PKC's ambitious plan of setting up a Centre of Excellence for STEM education.

I believe PKC has an important role to play in helping realize the Hon. Prime Minister's vision of turning India into a developed nation by 2047 which is one of the "Panch Pran" mandates. I have full confidence that the partnership between Praj and PKC will help Pune endure its reputation as the innovation capital for biotechnology.



**Dr. Sanjay Juvekar**  
Vadu Rural Health Program,  
KEM Hospital Research  
Centre, Pune

I would like to congratulate PKC on completing 2 years with some very notable achievements. In my interactions with PKC, I have been pleasantly surprised to see how a small team with leadership can generate a cluster of collaborators who are very much like-minded though with varied experience & expertise.

Incepted during the pandemic, PKC had the foresight to initiate some very important work at the city level for COVID-19. KEMHRC, Vadu was privileged to be associated with PKC for collaborative studies, including the VISION101 study which aims to understand the differences in magnitude and longevity of humoral and cellular immune responses generated following COVID-19 vaccination. Another study which we worked together on involved digitization and curation of retrospective data from confirmed hospitalized COVID-19 cases. These efforts will help in identification of correlations between virus genetics, clinical presentation, and the potential impact of interventions using machine learning and systems biology approaches. This is also an important capacity building exercise for all partner hospitals to venture into enhancing usability of hospital records which otherwise remain unutilized. Working with the PKC Team has been a pleasure because it gives a good sense of togetherness and confidence that data as well as knowledge generated will be used responsibly for the benefit of humankind.

I envision a much bigger role in strengthening the Science & Technology ecosystem of Pune, Maharashtra and going forward the nation.

PKC should act as a bridge between:

- Institutions involved in doing similar research work so that more representative evidence could be generated
- Institutions involved in different research work so that more interdisciplinary or integrative evidence could be generated
- Funding agencies and research institutions to enable forming a network of like minded people & institutions in Pune
- Evidence and practice by making available, all appropriate data or evidence to those in need especially the public systems and other policy makers
- Next generation of scientists, students and institutions doing work related to national priorities
- Science and citizens of Pune

I look forward to many more initiatives where PKC and KEMHRC,Vadu can collaborate and work together.



**Lt. Gen. Dr. Madhuri Kanitkar  
(Retd)  
Vice Chancellor,  
Maharashtra University  
of Health Sciences**

In a short time span the PKC has achieved major milestones towards the goals entrusted to the City Clusters under the Office of the PSA Gol. The vision and growth along the set path is noteworthy. The aim of bringing together Academia, Research Organizations, Industry and local stakeholders including citizens to find solutions for local problems with global relevance has been amplified as noted in the report.

A special compliment to PKC for harnessing the local community for COVID related research and providing inputs to local governance. PKC enabled genomic analysis of over 15,000 COVID-19 samples, which accounts for 2% of all positive samples from Pune. This also resulted in a significant representation of Pune's cases on the national INSACOG platform (6% of data on the INSACOG platform for COVID-19 is from Pune).

The initiative to include a large number of the scientific community available in Pune has a huge potential for growth and I am sure in times to come the Cluster will support initiatives beyond the initial members and find innovative solutions in the area of Health, Environment, Big Data and AI and Mobility.

Afforestation and Water Action Plan for Pune by PKC will be a huge project aligned to the National Action Plan on Climate Change and I am sure will make a difference to the local environment. The ideas and outcomes of these initiatives can be replicated by other cities and towns which are crumbling under urbanisation. A digital decision-making support system is planned by PKC using time-series and real-time absolute data, GIS maps, and analytics. This I am sure will harness the S&T potential of the city breaking silos.

The future looks bright with plans to build a centre for water management in collaboration with Water Valley, Denmark as well as a centre for carbon sequestration and renewable energy. The world is looking towards India and is willing to collaborate with Indian Academia to find sustainable solutions.

Capacity Building through webinars and workshops can be a huge help for skilling youth beyond the classroom and degree courses. PKC can be in a position to facilitate transdisciplinary courses as envisaged in the NEP2020 document. These courses can be tripartite between PKC and two or more universities and prepare youth for the job market. The envisaged Centre with a focus on innovation in school education, gamification in learning, STEM labs, girl education, and Math Circles is the way forward.

Using digital technologies PKC can connect people from diverse backgrounds to come together to work for common goals. I wish the PKC the very best and am sure PKC will establish itself as a leader showing the advantage of effective collaboration.



**Mr. Sanjay Kolte, IAS**  
Chief Executive Officer,  
Pune Smart City Development  
Corporation Ltd.



Outward no. PSCDCL/PKC/424/2022  
Date: 15.09.22

**TO WHOMSOEVER IT MAY CONCERN**

The Pune Smart City Development Corporation Limited (PSCDCL) and the Pune Knowledge Cluster (PKC) have had a successful collaboration since May 2021. The Pune Knowledge Cluster (PKC) approached PSCDCL last year, for a partnership on the PKC's program on Urban Forestry.

Improving climate resilience of the city is an important by-product of the Pune Smart City initiatives. The community engagement which is also a part of this program provides volunteering opportunities in the local communities for nurturing saplings planted by PSCDCL. This is an important step in stimulating citizen engagement and deepening the connection between the civic authorities and the citizens; as well as between the environment and the citizens.

A volunteering program requires significant work which was put up by the PKC with support from Centre for Environment Education (CEE, India). Nature Walks were conducted (26th February 22 at Oakwood Hills, Baner and 6th March 22 at Madhuban Society, Balewadi) and bamboo tree guards were installed to protect the saplings. The PSCDCL team, provided active support for these events. As a result of this effort, two citizen groups have come forward to "adopt" saplings in their neighbourhood. Paryavaran Sanrakshan Gatividhi is one of the groups that has committed their support towards nurturing saplings at Balewadi and establishing a model for government and citizen partnership.

PSCDCL has planted 20 thousand saplings in the smart city area. These have been planted along the roadsides, place-making areas, in school / college / hospital premises in PMC gardens and so on. The PKC's "Plant and Adopt a Sapling" program has tremendous synergy with the plantation initiative of PSCDCL. The Plant and Adopt a Sapling program is backed by a technology platform – ConnectTree – developed by the PKC. With ConnectTree, it is possible to demonstrate and monitor the planted saplings. As a pilot demonstration, ~300 saplings planted by the smart city have been successfully mapped onto this GIS enabled platform – ConnectTree. PKC consulted the PSCDCL team during the design of this platform to ensure that it could be integrated with the smart city infrastructure in the future.

Pune Knowledge Cluster have collaborated effectively to pilot this concept successfully during the past year. This would encourage improved survival rates for roadside plantations and the creation of additional carbon sinks where carbon is stocked within through these plantations as a way to offset residual emissions and counter existing and future trends of increasing carbon emissions. I hereby strongly recommend PKC for extending the program to other cities.



  
(Dr. Sanjay Kolte, IAS)  
Chief Executive Officer

Pune Smart City Development Corporation Ltd.

PUNE SMART CITY DEVELOPMENT CORPORATION LTD.

Reg. Office: "Manthan", A-3, Pashan Road (Near B.U. Bhandari Volkswagen Showroom), Abhimanshree Society, Pashan, Pune - 411008, Maharashtra.  
T : 020 - 25252525 | Website: www.punesmartcity.in

पुणे स्मार्ट सिटी डेव्हलपमेंट कॉर्पोरेशन लि.

नोंदणीकृत कार्यालय : "मंथन", ए३, पाषाण रोड (बी.यु. भंडारी वॉल्वेगन शोरोम), अभिमंश्री सोसायटी, पाषाण, पुणे - ४११००८. महाराष्ट्र



**Dr. Satyajit Mayor**  
Chairperson, (BLiSC),  
Centre Director, NCBS-TIFR

I have been associated with PKC on multiple COVID-19-related projects since its inception. Environmental and clinical surveillance to identify genome variants of SARS Cov-2 and longitudinal study on immunological response to vaccination among diverse groups in Pune, Bangalore and Vellore, are some of the examples. PKC has been an active partner in all these efforts and its program management skills have been a key to the success of all our projects.

As a city cluster, I anticipate PKC playing a major role in putting together and managing large multi-faceted multi-organizational projects that facilitate public health research, policy and forecasting strategies. I strongly believe that given the multi-institutional nature of PKC, it can take a unique and proactive role in creating an effective pandemic or epidemic preparedness strategy for the Pune region, and this will undoubtedly serve as a template for many other regions, including ours in Bangalore.





**Ms. Sanskriti Menon**  
Senior Programme Director,  
CEE

The Pune Knowledge Cluster is bringing science and technology applications to a range of issues for sustainable development in the Pune region. PKC is also fostering partnerships, thereby building on existing strengths and knowledge resources of civil society groups, industry, academia, and government entities. The backing and endorsement of the top scientific institution in the country helps to open doors and forge synergies among diverse actors.

For example, the ConneCTree initiative with CEE as a partner, is helping to prepare a database of tree plantations linked with individuals and groups who care for the saplings. The use of the ConneCTree app in a community engagement process that goes along with the plantation helps build interest, awareness, and a 'connection' to trees. In another initiative, PKC and its partners SPTM and CEE are conceptualizing the use of behavioural nudges to address mobility issues. Such application of scientific approaches and digital technology tools to address wicked issues along with locally embedded actors is expected to generate new knowledge, approaches, and on-ground initiatives.

We hope to see further development of systems understanding of critical issues in the Pune region, related databases and data collection processes. We also look forward to PKC creating inclusive platforms and processes for ideation and informed deliberation on critical sustainability issues: supporting green skilling and livelihoods in the Pune region, addressing air quality, water and waste water management, recycling and circular economy, mobility, biodiversity and nature-based solutions, heat stress, urban flooding and others that would enhance climate resilience.



**Dr. Nikhil Phadke**  
Founder - Director,  
Chief Scientific Officer,  
GenePath Diagnostics

GenePath Diagnostics would like to congratulate Pune Knowledge Cluster on completing two years of operations. PKC has been a key partner of GenePath - a clinical molecular diagnostics and genomic testing and kit manufacturing company based in Pune, India and Ann Arbor, Michigan, USA - through the COVID-19 pandemic.

We would like to thank PKC, particularly Dr. LS Shashidhara, for all the suggestions, connections and assistance provided during the early part of the pandemic and helping with transport of critical raw materials for our Covid-19 kits and enabling evaluations of our kits at CSIR-CCMB for subsequent ICMR + CDSCO approval. At later points in the pandemic, GenePath and PKC had a highly successful partnership where PKC coordinated whole genome sequencing of SARS-CoV-2 clinical samples tested at GenePath at INSACOG partner labs like NCL and IISER, and many samples sequenced across country during the middle to late stages of the pandemic came from this partnership. In fact, this was the very study during which the first patient infected with the Omicron variant of concern in Pune city was identified and sequenced within three days of initial testing at GenePath.

In parallel, PKC has also been a key partner with organizations across the country that have been using GenePath quantitative SARS-CoV-2 RT-PCR kits to monitor viral abundance in waste-water samples. This work has allowed advance prediction of localized spikes through the multiple waves seen in the country without the need to test individuals. In addition to all the practical benefits of the work carried out by the PKC-led coalition during the pandemic, there has also been a tremendous building of community, pan-organizational collaboration, and academic progress.

We look forward to a continued long-term mutually beneficial association between all the partners under the PKC umbrella.



**Dr. Sapna Poti**  
**Director,**  
**Strategic Alliances Division,**  
**The Office of PSA, Gol**

The Pune Knowledge Cluster (PKC) has been one of the pioneers in leading the way for Indian Science, Technology and Innovations clusters. The cluster has redefined India's growth story in various areas of science and technology. Their leadership i.e. Dr. Mashelkar, Prof. L.S. Shashidhara, Prof. Ajit Khembavi and Prof. Somak Raychaudhury have been inspirational to the cluster institutions. The COO, Dr. Priya Nagaraj has been dynamic in leading various initiatives in Health, Capacity Building, Sustainability & Environment and Mobility.

The cluster has worked closely with the State Government and made an impact during the pandemic within the State and the Nation at large, especially in surveillance and genome sequencing. The working model that the cluster architected and leveraged during the pandemic has also formed the core of high impact success that the cluster is experiencing consistently post pandemic in all their Science and Technology projects as well. Focus has been on sustainability and scalability.

Since its formation the cluster has focused on both fundamental and applied R&D Projects balancing it appropriately. They have forged effective partnerships with Industries and harnessed all collaborations that were shared by the office of the PSA, Gol seamlessly along with their own efforts of Industry engagements. The cluster has focused in areas that are of National importance and has gone beyond its mandate of focusing on the State. Several National programs have been designed in areas of Genome Sequencing, Environment, Health, Big data and AI, STEM education and implemented throughout the Nation. PKC has managed various partners of eminence such as BASF Chemicals India Pvt Ltd, Hindustan Unilever, Rockefeller Foundation, Persistent Systems, Lenovo India Foundation.

Further, the cluster has excellent inter-cluster relationships and has collaborated as well as worked extensively towards capacity building of other clusters and institutions across the Nation. Currently several newer organizations are looking to engage with PKC in various capacities including setting up of relevant Centers of Excellence, National Gamification Repositories, Mobility initiatives and more.

Though the Cluster is fairly young the results have already been demonstrated by the team and is a testament to the impact the cluster has made to the current Science and Technology ecosystem in the Nation. Wishing the leadership of the cluster and all its institutes, startups, industry partners and state Government good luck for its future endeavours.



**Mr. Ayush Prasad, IAS**  
**CEO,**  
**Pune Zilla Parishad**

We started interactions with the Pune Knowledge cluster about a year ago on a few focus areas of interest to the Pune Zilla Parishad. We had several meetings over many months discussing projects for school improvement, STEM education, community biogas and water conservation initiatives.

PKC in collaboration with District Institute of Education and Training (DIET) conducted a survey with 1500 + Zilla Parishad school teachers to understand learning gaps as a result of the pandemic. On the basis of the survey, PKC designed and conducted an online workshop for school teachers called “Concepts in Science and Skill Development” in association with the Pune Zilla Parishad and DIET. The workshop focused on training teachers from Zilla Parishad schools to use digital technologies and methods for teaching. 450 teachers participated in the workshop and it was well received.

We also had several detailed meetings with PKC about a community biogas project which ZP aims to mobilise in villages strengthening the existing 400 Biogas plants. PKC contributed by providing economic and technology feasibility analysis for the project and also advised on how solid waste and agricultural waste from villages can be used to make CBG leading to overall socio-economic development of villages.

The Pune Zilla Parishad has identified 108 water stressed villages in Pune district which are in need of interventions for water conservation. PKC undertook a study for one such village, Washere in Khed Taluka to holistically understand water issues in the village. They interacted with the local community, used experts from the Cluster to do GIS based mapping of the region and plan where water bodies can be constructed. PKC mapped 12 locations for creating water storage systems and submitted the map to Zilla Parishad.

A science and technology driven Cluster that facilitates bringing together various stakeholders to work for the betterment of the city is essential for the growth and development of a city like Pune. I see immense value in supporting an initiative like this and look forward to working with PKC on many more initiatives going forward.

## HEALTH



“Vaccination, testing and surveillance were vital to check the Covid spread and emergence of new variants in India. It is, crucial to strengthen surveillance (SARI, ILI and wastewater monitoring) to understand how the virus is circulating in the community. We should also sequence a small percentage of the circulating viruses to know if there are new emerging variants. The data should be shared globally. If every country does this, we can stay ahead of the virus”

**Dr. Soumya Swaminathan,**  
Chief scientist, World Health Organisation (WHO)

Pune was one of the worst hit cities in India during the COVID-19 pandemic. Being the need of the hour, the Pune Knowledge Cluster played an integral role in supporting the public health system and government strategies aimed at disease containment.

PKC's COVID-19 efforts focused on comprehensively understanding the epidemiology of the SARs-CoV-2 virus and work toward strategies to mitigate and reduce the disease burden in the Pune region (Fig. 1).



Projects of this vertical align with:



## NATIONAL MISSIONS

- National Health Mission
- Integrated Disease Surveillance Project (IDSP)

## SUSTAINABLE DEVELOPMENT GOALS

### 03 GOOD HEALTH & WELL-BEING



### 09 INDUSTRY, INNOVATION AND INFRASTRUCTURE



### 17 PARTNERSHIPS FOR THE GOALS

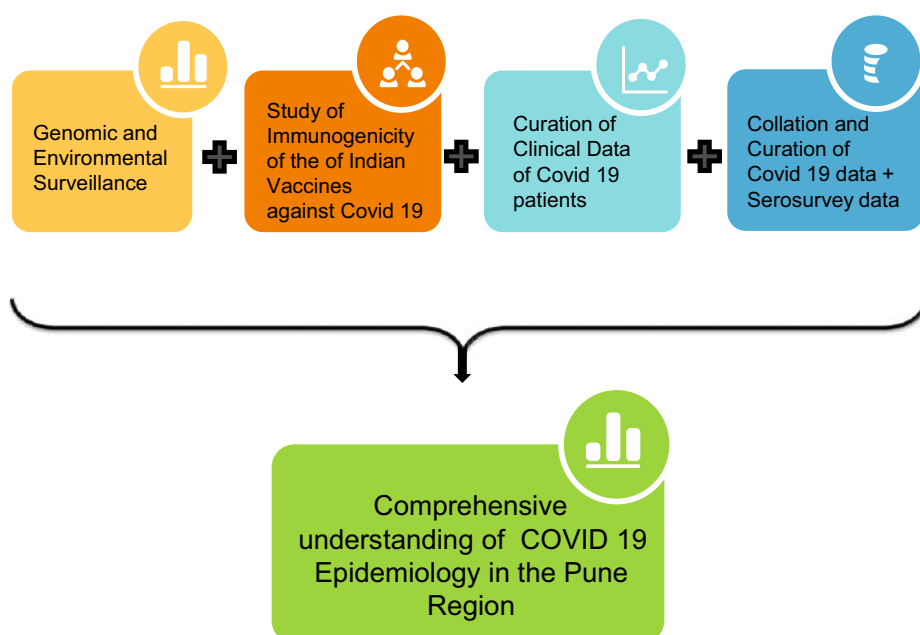


Fig. 1: PKC's strategy for understanding COVID - 19 comprehensively at the city level



## Objectives

- Build synergistic collaborations to aid systematic collection, analysis, and interpretation of public health data, and policy making.
- Work with the local government to understand their health and disease priorities and build prevention and mitigation strategies.
- Creating awareness about public health management and innovation amongst citizens via talks by experts.

## Highlights

- **Funds raised for COVID-19 projects**
  - INR 5.25 CR
  - Facilitated raising of INR 3.68 CR for partner institutions
- **Strong scientific support created for the local government during the pandemic**
  - Creation of a COVID-19 dashboard for Pune city
  - Sero-surveys in high disease-incidence wards
- **Significant contribution to COVID-19 testing in the country; facilitated the sequencing of**
  - 2% of all positive samples from Pune sequenced
  - 6% of all data submitted to INSACOG was facilitated by PKC
- **Enabled scientific research in COVID-19**
  - Scientific Publications : 6

## Activities

- COVID-19 Data Analysis and Forecasting for Pune City
- COVID-19 Sero-Survey
- COVID-19 Disease Surveillance (Genomic and Environmental)
- COVID-19 Long-Term Immunogenicity Study
- COVID-19 Epidemiological and Clinical Database for Pune
- Development of an Early Warning System for Infectious Diseases

## COVID-19 Data Analysis and Forecasting - Pune City

During early stages of the pandemic, the Indian Government and the Indian Council of Medical Research (ICMR) constituted guidelines for centralized collection of demographic and clinical data such as total case count, mortality, hospital occupancy as well as guidelines for clinical management. Pune City managed by Pune Municipal Corporation (PMC), successfully initiated and maintained the Government mandated norms for data compilation from clinics and hospitals.

The PMC and PKC entered into a collaborative agreement in April 2020 to develop and implement local policies based on the analysis of COVID-19 patient data.

### PKC's role in the collaboration (Fig. 2):

- Curation of data
- Analysis of data at the sub-region level (Prabhags)
- Modelling of the data to project the pandemic curve
- Constitution of a project to assess the prevalence of positive serology among the population and coordination for resource procurements and allocation

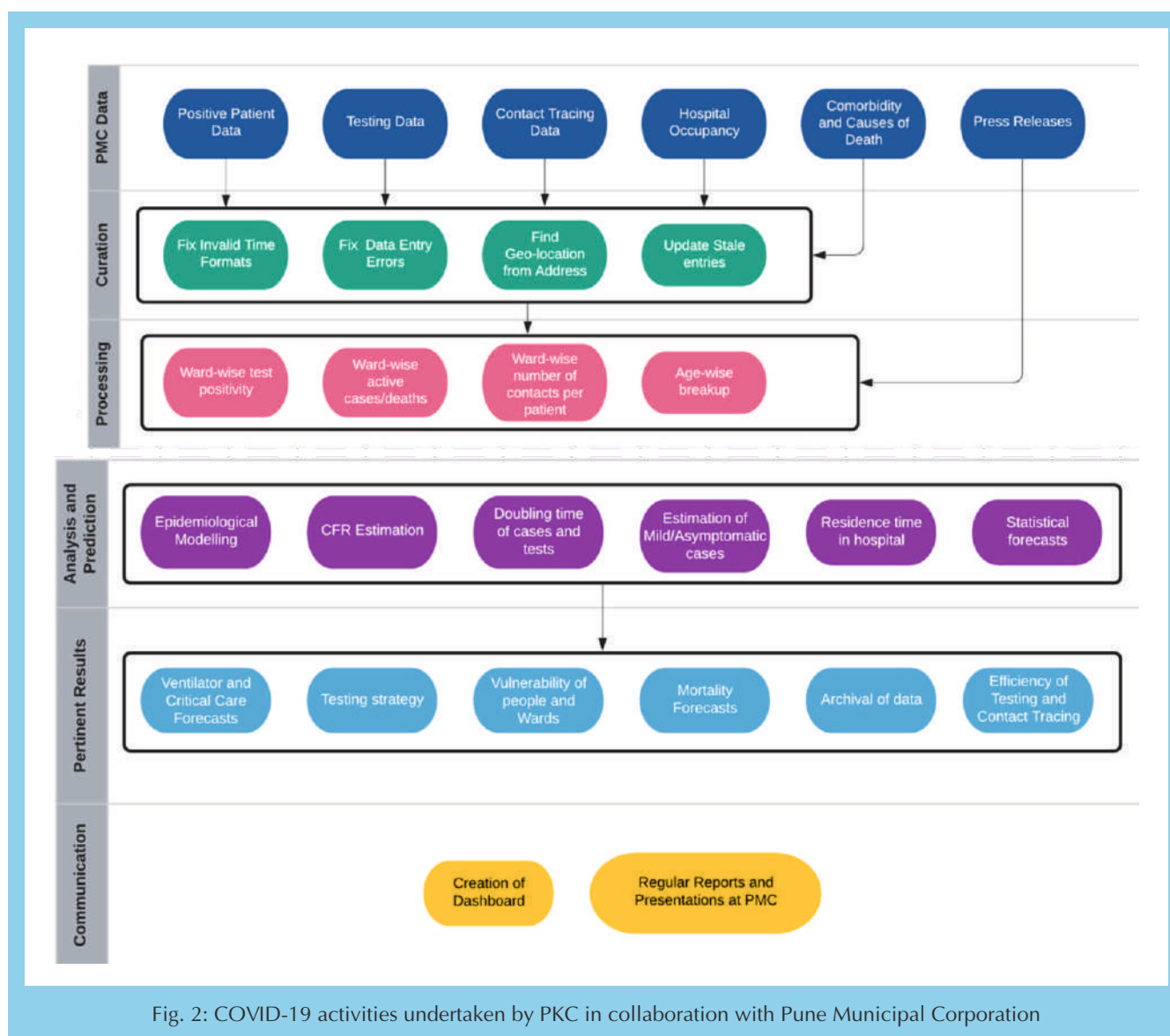


Fig. 2: COVID-19 activities undertaken by PKC in collaboration with Pune Municipal Corporation

## Impact

- A publicly available dashboard on forecasts for COVID-19 in Pune was developed based on the incident COVID-19 cases over time, case doubling time and trajectory at the city levels and sub-region levels. Forecasting was done using the INDSCI-SIM epidemiological model, a state-level model for India developed by the group - Indian Scientists' Response to COVID-19 (ISRC).
- The epidemiology and impact of lockdowns on the incidence of COVID-19 cases was assessed.
- Accurate forecasting of the incidence of COVID-19 was done by experts associated with PKC. This enabled timely procurement of SARS-CoV-2 test kits, ventilators, and the establishment of additional test facilities, flu clinics and COVID-19 care centers.
- COVID-19 hotspot pockets within the city with high population density were identified and those areas were contained to limit transmission.

## COVID - 19 : Sero - Survey

A large proportion of SARS-CoV-2 infections remain asymptomatic and undetected unless screened for antibodies against the virus. Serological testing of a representative sample population is essential to estimate cumulative incidence of disease in the community. Sero-prevalence of antibodies against SARS-CoV-2 in five high-incidence Prabhags (subwards) of Pune was assessed to gain insights into the spread of the pandemic in the city. The study recruited 1664 individuals in 5 selected Prabhags (20th July - 5th August 2020).

### Sponsor:

Persistent Foundation, Pune

### PKC's role in the project:

- Putting together a consortium to implement the project
- Enabling fundraising, obtaining permissions from PMC and dissemination of data

### Partners:

- IISER-Pune, Pune
- Savitribai Phule Pune University
- Pune Municipal Corporation (A key partner and stakeholder for this study. Data generated from the study has been submitted to PMC)
- Christian Medical College, Vellore
- THSTI, Faridabad

### Impact:

- The sero-surveillance dissected statistical profiling of Pune prabhags and indicated that there has been an extensive spread of infection in these Prabhags. 51.5% (CI: 49.1-53.9%) seroprevalence was reported in the five high-incidence Pune city Prabhags sampled.
- Based on the sero-survey, local officials were alerted about the imminent heavy load on the public health care system of the concerned Prabhags. Consequently, the city administration proactively increased testing and surveillance in these Prabhags.

### Publications:

- Community prevalence of antibodies to SARS - CoV-2 and correlates of protective immunity in an Indian metropolitan city. *Aurnab Chose, Sankar Bhattacharya, Arun S. Karthikeyan, Abhay Kudale, Joy M. Monteiro, Aparna Joshi, Guruprasad Medigeshi, Gagandeep Kang, Vineeta Bal, Satyajit Rath, L. S. Shashidhara, Jacob John, Susmita Chaudhuri, Aarti Nagarkar*; medRxiv 2020.11.17.20228155; doi: <https://doi.org/10.1101/2020.11.17.20228155>
- Into the thirteenth Month: A Case Study on the Outbreak Analytics and Modeling the spread of SARS-CoV-2 Infection in Pune City, India. *Joy Monteiro, Bhalchandra Pujari, Sarika Maitra Bhattacharria, Anu Raghunathan, Ashwini Keskar, Arsh Shaikh, Prasad Bogam, Shweta Kadu, Nikita Raut, Devendra Vavale, Rupa Mishra, Ajit Kembhavi, L. S. Shashidhara, Vidya Mave*; medRxiv 2021.06.22.21259295; doi: <https://doi.org/10.1101/2021.06.22.21259295>

## COVID-19 - Disease Surveillance & Genomic Sequencing

During the pandemic, a national-level consortium called The Indian SARS-CoV-2 Genomics Consortium (INSACOG) was created jointly by The Union Health Ministry, The Department of Biotechnology (DBT), The Council for Scientific & Industrial Research (CSIR) and The Indian Council of Medical Research (ICMR). The consortium consists of premier academic, research, philanthropic and industry organizations which came together to conduct nationwide genomic sequencing to track SARS-CoV-2 variants and accelerate national data sharing of sequences and bioinformatics - based research.

PKC is a part of this consortium and has helped synergize a multi-stakeholder collaboration in Pune to upscale genomic surveillance by ramping up sequencing efforts, bio-informatics, and data sharing based on a sampling strategy predicated on epidemiological data and clinical meta-data (Fig. 3). PKC facilitated prospective, clinical, and retrospective sequencing of samples with a focus on vaccine breakthroughs and reinfection cases. Experts correlated the epidemiological dynamics and clinical outcomes of patients and aided in the implementation of appropriate public health and medical counter measures. Environmental Surveillance focused on the collection and analysis of sewage and wastewater samples from various parts of the city to complement human surveillance and enable early detection of disease, considering that a large proportion of infected people are asymptomatic.

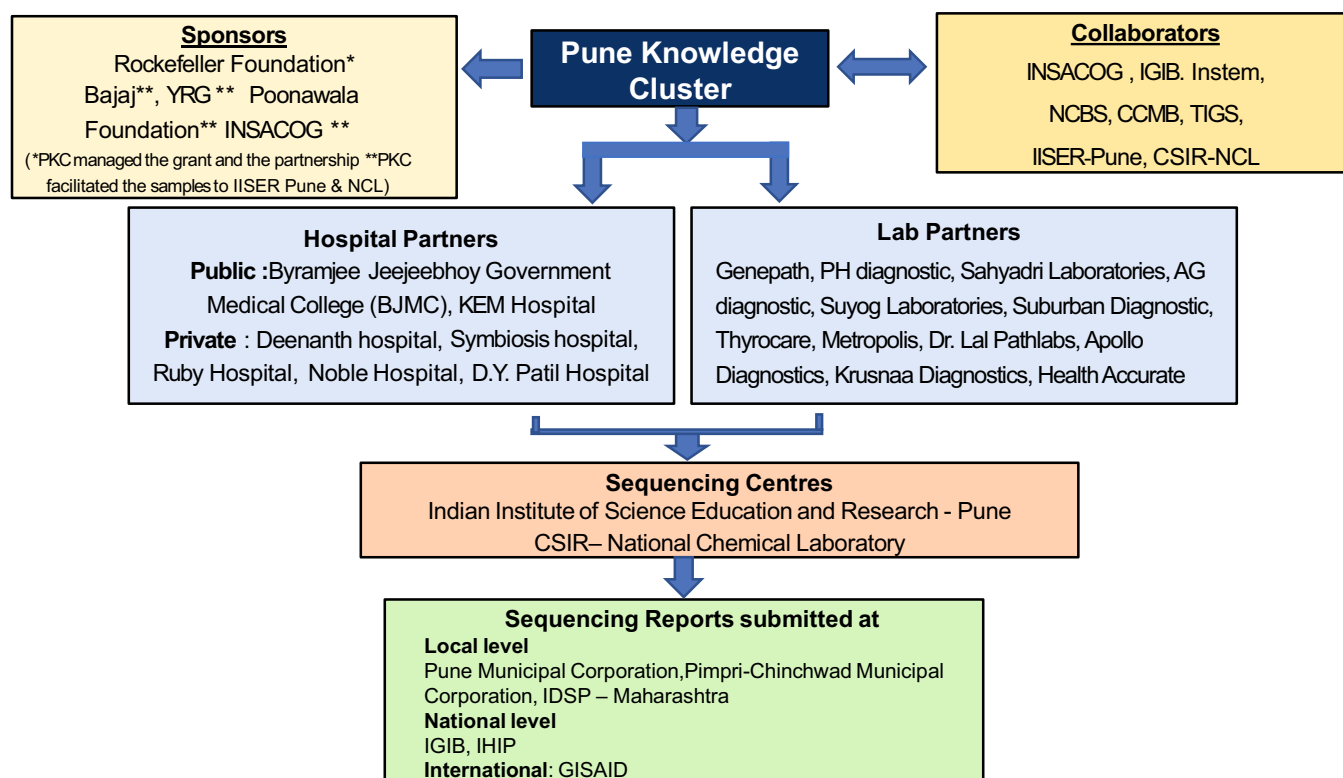


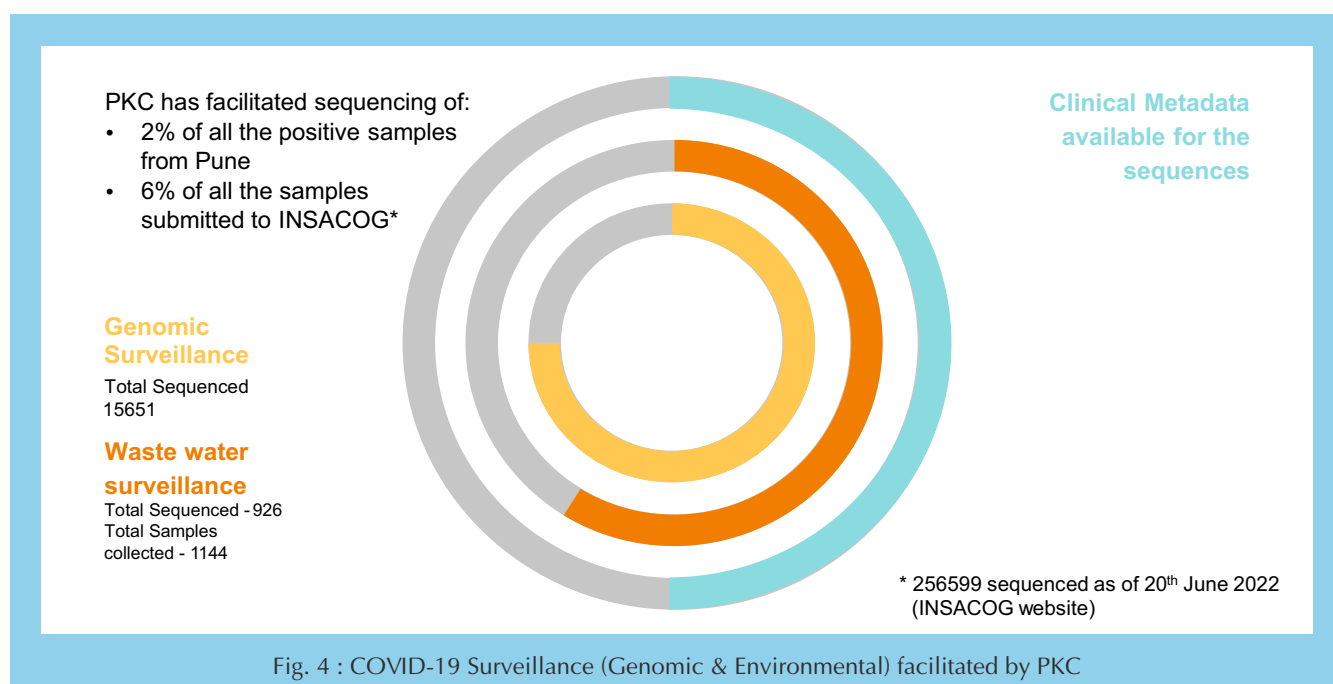
Fig. 3: Work Flow - Environmental Surveillance & Clinical Sample Variant Surveillance for COVID-19

### Sponsor:

- Rockefeller Foundation

### Impact:

The project contributed significantly to COVID-19 sequencing efforts in India (Fig. 4). Through the project, 2% of all positive samples from Pune have been sequenced and 6% of all data submitted to INSACOG was facilitated by PKC.



### PKC's role in the Project:

- Identification and selection of stakeholders
- Sample acquisition and sampling strategy
- Standardization of sample collection procedures
- Building and maintenance of data depository
- Dissemination of results to relevant stake-holders
- Fund Management and People Management

**Project Status :** Ongoing

### Reporting of data:

- Weekly reports submitted to PMC
- Data was also shared by Pune Platform for COVID-19 Response (PPCR) and other key stakeholders to enable city level decisions
- Sequences shared on International and National databases for analysis

### Publications:

- Mave, V., Shaikh, A., Monteiro, J. M. et al. Association of national and regional lockdowns with COVID-19 infection rates in Pune, India. Sci Rep 12, 10446 (2022). <https://doi.org/10.1038/s41598-022-14674-0>
- Bogam P, Joshi A, Nagarkar S, Jain D, Gupte N, Shashidhara LS, Monteiro JM, Mave. V Burden of COVID-19 and case fatality rate in Pune, India: an analysis of the first and second wave of the pandemic. IJID Reg. 2022 Mar;2:74-81, Epub 2021 PMID: 35721428; PMCID: PMC8690685 <https://doi.org/10.1016/j.ijregi.2021.12.006>
- Dharmadhikari, T., Yadav, R., Dastager, S. et al. Translating SARS-CoV-2 wastewater-based epidemiology for prioritizing mass vaccination: A Strategic Overview. Environ. Sci. Pollut. Res. 28, 42975–42980 (2021). <https://doi.org/10.1007/s11356-021-15169-7>
- Dharmadhikari, Tanmay, et al. High throughput sequencing based direct detection of SARS-CoV-2 fragments in wastewater of Pune, West India. Science of The Total Environment 807 (2022): 151038. <https://doi.org/10.1016/j.scitotenv.2021.151038>.



## COVID-19: Long-Term Immunogenicity Study

The kinetics and longevity of immune responses generated by COVID-19 vaccines in the Indian population are not completely understood. To bridge this knowledge gap, a research study for multi-dimensional understanding of immune responses to SARS-CoV-2 was conducted in two cities including Pune (Fig. 5). The primary objective of the study was to understand differences in magnitude and longevity of humoral and cellular immune responses generated after vaccination with Indian vaccines for COVID-19 in individuals with or without evidence of prior SARS-CoV-2 infection based on sero-positivity.

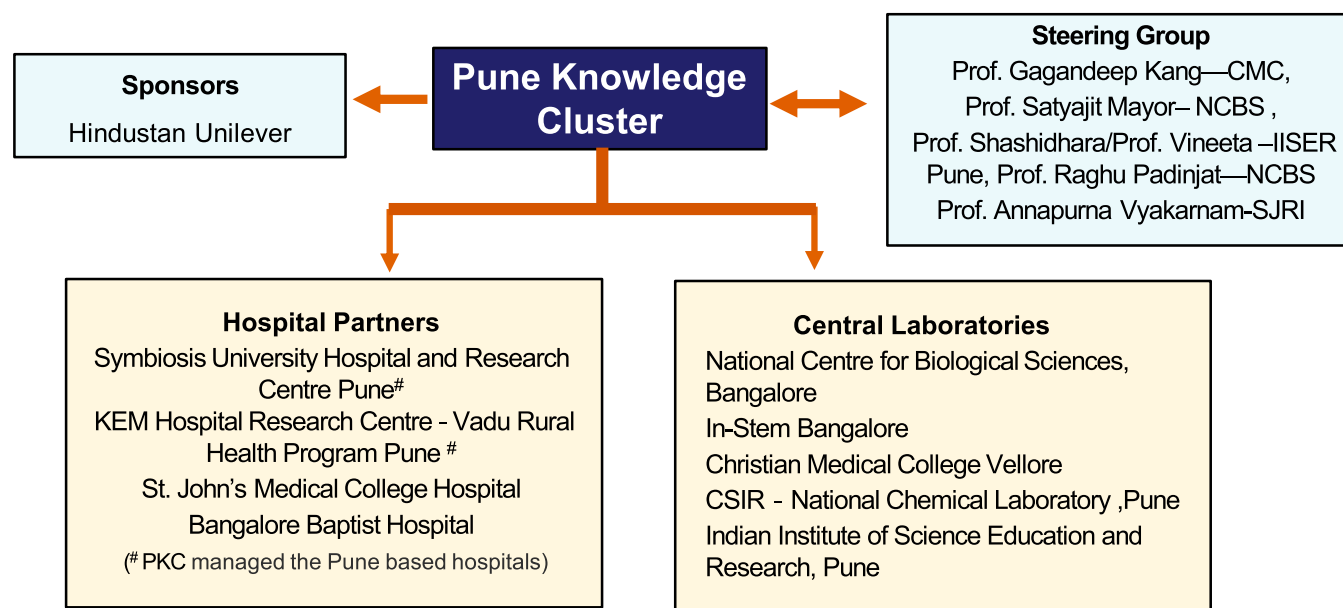


Fig. 5: Organizations Involved in the COVID-19 Long-Term Immunogenicity Study

### Sponsor:

- Hindustan Unilever Ltd.

### PKC's role in the Project:

- Identification and selection of stakeholders
- Development of Electronic Case Report Forms (eCRFs), and Standard Operating Procedures (SOPs) for sample collection and clinical investigations
- Fund Management and People Management
- Working and liaising with trial sites and laboratories

### Impact:

- More than 300 individuals from Pune city participated in the COVID-19 Long Term Immunogenicity Study over a 9-month period.
- Insights were generated for the role of innate immunity, microbiome, and micronutrient biomarkers on the immune response to the COVID -19 vaccine in the Indian subpopulation (Manuscripts under preparation).

**Project Status:** Phase 1 Completed; Study has been extended

## COVID-19 Epidemiological And Clinical Database

PKC has used a data driven approach to understanding and implementing measures for COVID-19. Over the past 2 years, PKC in collaboration with hospitals, research organizations and civic bodies in Pune has collected and curated data for COVID-19 at various levels (Fig.. 6). This includes data for disease prevalence, hospitalized patients, testing and mortality (Fig.. 7). PKC is working to build comprehensive open source databases consisting of epidemiological, clinical and genomic data for COVID-19 which can be used by researchers and civic authorities to build city level models for understanding disease impact and progression (Fig. 8).

**Project Status :** Planning phase

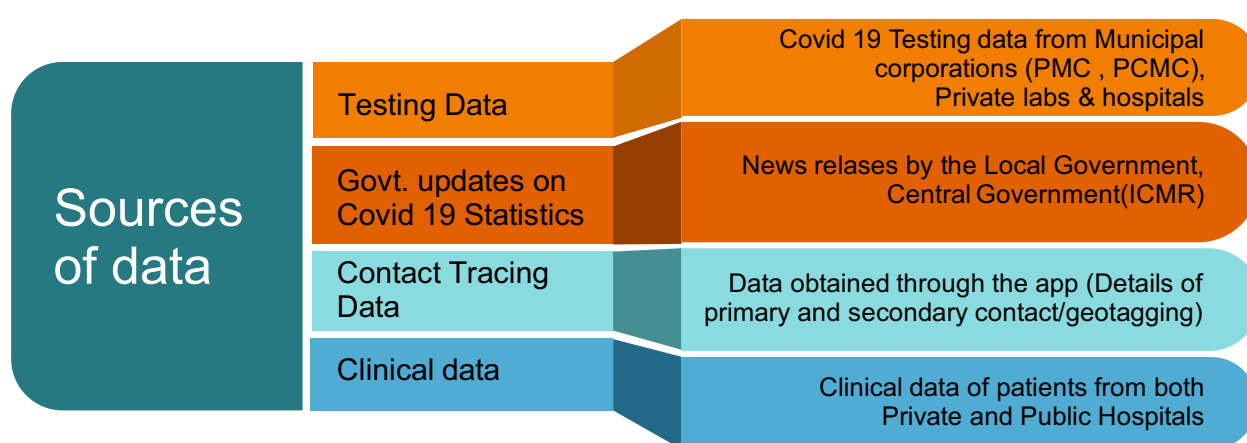


Fig. 6: Sources of COVID-19 Data Collected by PKC

### Disease prevalence

(Per day data)  
(April 2020 - June 2022)

- +ve detected /recovered/discharged
- Critical/ on Ventilator
- Progressive samples collected
- Covid patients
- Active cases
- Progressive positive patients recovered/discharged
- Progressive number of deaths amongst +ve patients
- Number of house-survey teams
- Population covered by survey
- Houses covered by the survey
- Patients with flu or other illness found in the survey

### Mortality data

(March 2020 - March 22)

### Patient data

(March 2020 - March 22)

Parameters – ICMR No  
Lab name  
Patient ID  
Age  
Gender  
Date of Isolation  
Patient outcome  
Ward office  
Prahag  
Zone  
Patient status

### Covid 19 Testing

(April 2020 till June 2022)

Parameter - Age  
Gender  
Date of isolation  
Address  
Result  
Source of sample

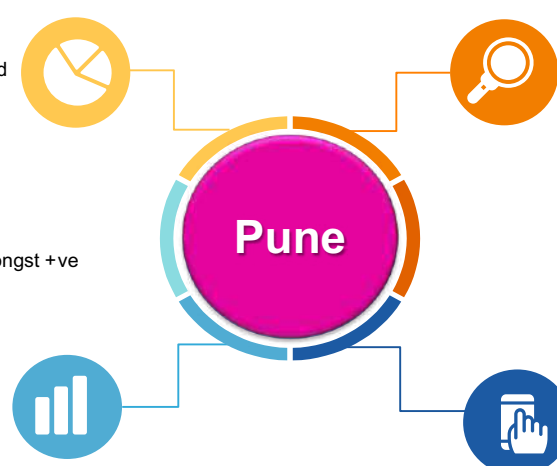
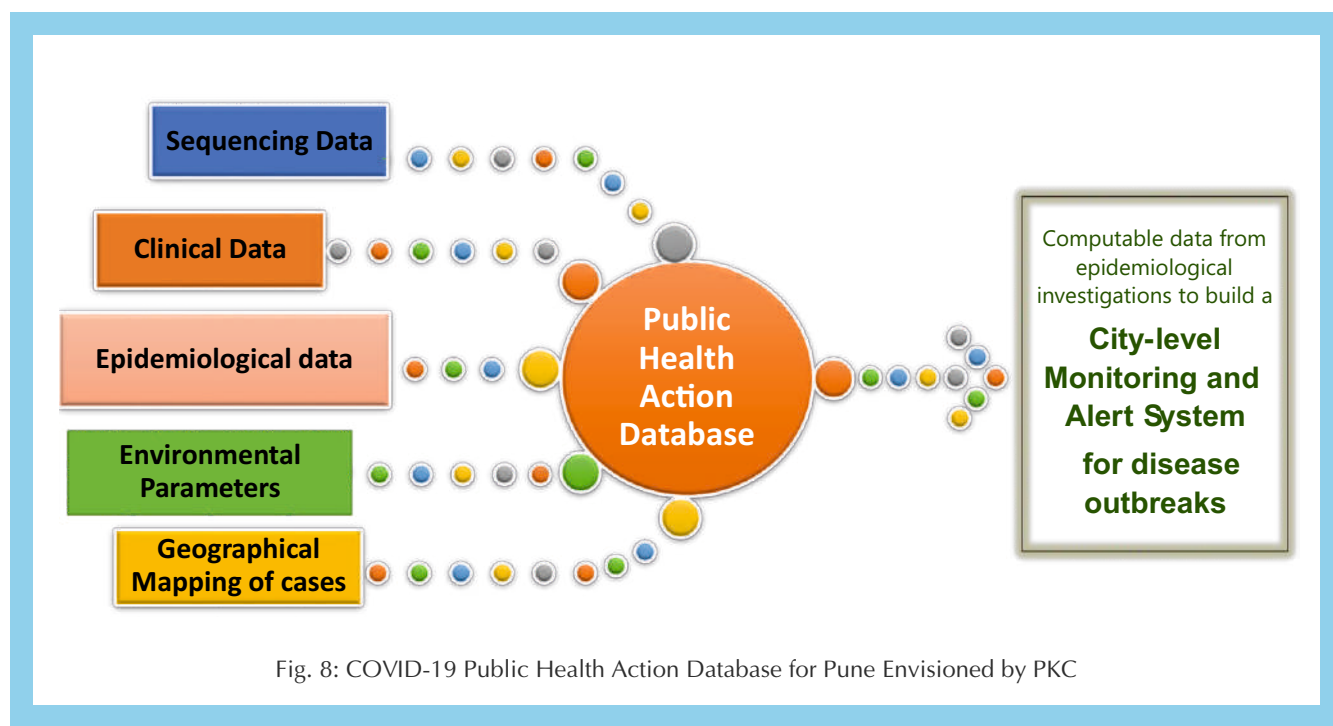


Fig. 7: Types of COVID-19 Datasets Collected by PKC



## Projects in pipeline

Development of an early warning system for infectious diseases: PKC plans to build an integrated surveillance system for Dengue and Anti-Microbial Resistance (AMR). The system will include channels for information flow between clinical and administrative partners to allow for timely prediction of disease risk and spread in communities.

## Partners

### Funding Partners



### Program Partners





## Sustainability & Environment



“Just as our vision behind Agenda 2030 is lofty, our goals are comprehensive. It gives priority to the problems that have endured through the past decades and, it reflects our evolving understanding of the social, economic and environmental linkages that define our lives.....

The sustainable development of one-sixth of humanity will be of great consequence to the world and our beautiful planet.”

**Shri. Narendra Modi, Prime Minister of India**  
- At the UN Sustainable Development Summit

With a core emphasis on sustainability and climate action, the Pune Knowledge Cluster supports India's commitment to the 2030 Agenda. The activities of PKC's Sustainability and Environment vertical particularly align with the SDGs 6, 11, 13, and 15.



Projects of this vertical align with:



## NATIONAL MISSIONS

- National Mission on Strategic Knowledge for Climate Change
- National Mission for a Green India
- National Biodiversity Mission
- National Mission on Sustainable Habitat
- National Water Mission



04  
QUALITY  
EDUCATION



06  
CLEAN WATER  
AND SANITATION



11  
SUSTAINABLE CITIES  
AND COMMUNITIES



13  
CLIMATE ACTION



15  
LIFE ON LAND



17  
PARTNERSHIPS  
FOR THE GOALS





## Objectives

- Improving urban and peri-urban vegetation cover in Pune and surrounding regions to contribute to the national environmental objective of additional natural carbon sinks while meeting local socio - economic and environmental needs through afforestation and habitat improvement measures.
- Understanding regional environmental issues, developing policies for efficient use of resources, and facilitating the implementation of solutions via collaboration between various stakeholders - civic bodies, citizens, NGOs and corporate sponsors
- Working towards climate-proofing of the Pune Metropolitan Region by securing water, food & livelihood through programs focused on multi-dimensional sustainability

## Highlights

- **Funds raised for programs: INR 23 Lakhs**
- **Number of policy documents under development : 2**
- **Number of Digital platforms and tools for Environmental Monitoring developed/ under development : 2**
- **Number of citizen engagement events conducted : 8**

## Activities

- Programs for sustainable increase of vegetation cover in the Pune Metropolitan Region
- Monitoring and evaluation of environmental programs
- Policy Advocacy

## PROGRAMS FOR SUSTAINABLE INCREASE OF VEGETATION COVER IN PUNE METROPOLITAN REGION

Pune Knowledge Cluster is working towards enhancing the carbon sinks in the region by facilitating plantation activities in both urban and peri-urban areas in the Pune metropolitan region (Fig. 1). As a knowledge partner, PKC helps in the incorporation of aspects of multi-dimensional sustainability at the social, economic, and ecological levels in plantation and afforestation activities.

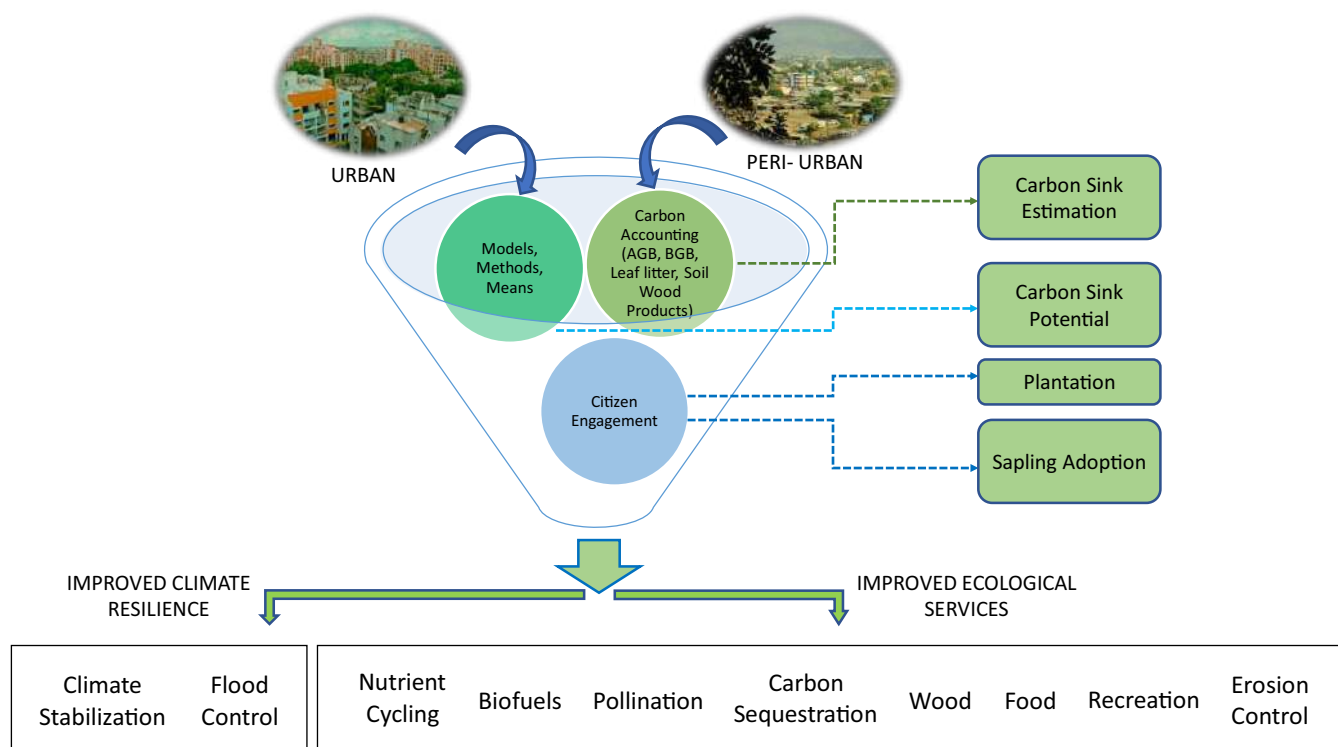


Fig. 1 : PKC's approach toward the sustainable increase of vegetation cover

### PKC's Role as a Knowledge Partner in Sustainable increase of vegetation cover in the Pune region:

#### Defining Objectives for Plantation

- PKC helps stakeholders to define objectives of afforestation such as Carbon Sequestration, Greening, Biomass Production, Food Forest & Fodder, Medicinal Plants, Agro-forestry Disaster Risk Management, Soil enrichment and Biodiversity Parks

#### Conducting Pre-Plantation Studies

- Status study of 5 pillars of the plantation – Water, Land, Forest, Animals and Humans
- Plantation site identification
- Sustainability Plan – Ecological, Social, Economical
- Integrated learnings from natural forests
- Water Conservation action plan
- Soil conservation action plan
- Species selection based on inter-intra species interactions

**Building of Technology based Monitoring and Reporting Tools**

- Estimation of carbon sink potential pre-plantation
- Platform to adopt, monitor and track planted saplings through citizen engagement
- Automated, scalable platform for tree census using satellite imagery and LiDAR

**Conducting Training and Skilling Programs for Sustainable Socio-Economic Development**

- Courses on Nursery Development
- Awareness program on Scientific plantation methods
- Introductory courses on Environmental, Social & Governance (ESG)

**Peri - Urban Forestry Programs****Sustainable Large Scale Afforestation Model Pilot on Forest Lands:**

PKC aims to develop self-sustaining (socially, financially, and environmentally sustainable) Biodiversity Parks on degraded reserve forest land. Sites identified are Loni-Kalbhor (outskirts of Pune) and Medhankarwadi, Chakan, Maharashtra.

**Planned activities**

- Develop an Integrated Conservation and Management Plan for the development of the area.
- Watershed activities, soil preparation, and irrigation-related activities
- Plantation activities along with its maintenance and infrastructural development, tourism facilities, and supplementary livelihood facilities
- To make the forest self-sustainable, plantation models based on inter and intra-species interactions will be developed to increase yields of timber, wood for the paper and plywood industry, NTFPs and biomass for bio-fuels to supplement domestic and agri-waste
- Each phase will also see the development of a buffer zone along the forest boundaries to check encroachments and grazing by livestock

**Intended Impact**

- Green House Gas (GHG) sequestration
- Increment in tree density up to 1000 trees per ha. on 900 ha to increase richness and abundance of flora and fauna respectively
- Employment to laborers through tourism, NTFP (biomass and other products), and management activities
- Revenue through sale of NTFPs, tourism, biomass (biofuels), apiculture and pisciculture.
- Supplementing Bio-CNG plants with biomass from the forests shall improve farmers income by Rs. 2,000/- p.ton from dry agri wastes and saving of waste disposal costs namely Rs. 2,000/- per ton of wet domestic wastes per day for gram panchayat
- Reduced emissions through 5 tonnes of Bio-CNG about 1 million tCO<sub>2</sub> eq. per annum

## Green Web - Urban Forestry Program

Pune Knowledge Cluster works on various initiatives to promote and sustain urban forestry. The objectives of Green Web include:

- Promoting urban forestry with particular emphasis on the plantation of native and ecologically suitable species
- Public engagement through plantation drives and nature walks
- Developing an easy-to-use IT platform for tracking & monitoring sapling health through citizen engagement
- Facilitating interaction between civic bodies, citizens, and sponsors to create sustainable greenery in the city

PKC's urban forestry initiatives have been supported by Cummins Foundation and Schlumberger.

### Intended Impact

- To increase survival rates of sapling plantations in the city using a data and technology driven approach
- Improved conservation efforts through public participation & scientific knowledge

### Green Web Programs:

- ConnecTree
- TreeVerse
- Carbon Neutral Campus

### ConnecTree

ConnecTree is an AI-enabled interactive platform for choosing, promoting, tracking, and maintaining sapling plantations by citizens, sponsors and local government bodies. Through this platform, PKC in collaboration with NGOs facilitates plantation drives and nature walks to increase awareness about the importance of ecological conservation amongst citizens and sponsors (Fig. 2).

### Status

- No. of saplings brought under ConnecTree: 200
- No. of saplings sponsored: 11
- NGO Caregivers: 3 (CEE India, Environment Conservation Association, Paryavaran Gatividhi)
- Survival Rate of Sponsored Saplings: 70%



Fig. 2: PKC team members and Officials of Pune Municipal Corporation & Pune Smart city participating in Adopt a sapling program.



Fig. 3 : Volunteer collecting sapling health data using ConnecTree platform

## Monitoring and Evaluation of Environmental Programs

### TreeVerse

A computational model for carbon sink estimation which can enable city authorities/ administrators for planning initiatives for carbon neutrality.

TreeVerse program is an AI-based automated tree demography model that provides a technology platform to carry out ecological studies on urban plantations. It will also contribute, in part, to the nation's commitment to the enhanced transparency framework that provides information on the implementation and achievement of national objectives as part of the nationally determined contributions (NDCs) in the Paris Agreement.

### Activities

- Carbon Accounting
  - a. Geo-spatial data mining to estimate and characterize the tree cover of a region
  - b. Calculating Current Carbon potential using current tree census
- Estimating Carbon Sink Potential
  - a. Tree growth modelling & predicting carbon sequestration

### Intended Impact

- Estimation of required carbon sink capacity in 2030/ 2035
- Development of a tool for Urban Planners and Industries to plan and implement their carbon sequestration efforts
- Improved biodiversity & habitats through data-driven conservation strategies.



Fig. 4 : Trees tagged at IISER Pune Campus

### Status

- Tree Tagging (Fig. 4) in Pune city (April 2021 to March 2022)
  - Species tagged: 32
  - Trees: tagged: 777
  - No. of Institutes, College/ University Campus/ Gardens tagged: 24

## Carbon Neutral Campus Initiative

PKC is working with Samuchit Enviro Tech, a member of the Indian Network on Ethics and Climate Change (INECC) as well as Climate Collective Pune (CCP) on a collaborative project called The 'Carbon Neutral Campus Initiative (CNC) - which aims to trigger climate change discussion and climate action in educational and institutional campuses. The overarching objective of CNC is to motivate and mentor administrations of educational institutes to go low carbon (preferably carbon neutral) on their campuses.

### Activities

Under this project, carbon accounting for campuses is performed by estimating their carbon emissions (eg. fossil fuel consumption, electricity consumption) and the carbon sequestration capacity coming from the green cover (trees). Based on these calculations, recommendations are made by experts for possible new technologies, services, structural and procedural changes that may be undertaken to further reduce carbon emissions and/or increase carbon sequestration through sinks and offsets on and off the campuses.

### Progress

Carbon accounting for two educational institutions has been completed (Fig. 5), and the report has been submitted to the institute administration. The work has been accepted as an abstract in the 8th IEEE International Smart Cities Conference (ISC2 2022) -"Community Smartification and towards ZERO emission Smart Cities for a Green New Era", to be held at Paphos, Cyprus from 26-29 September 2022

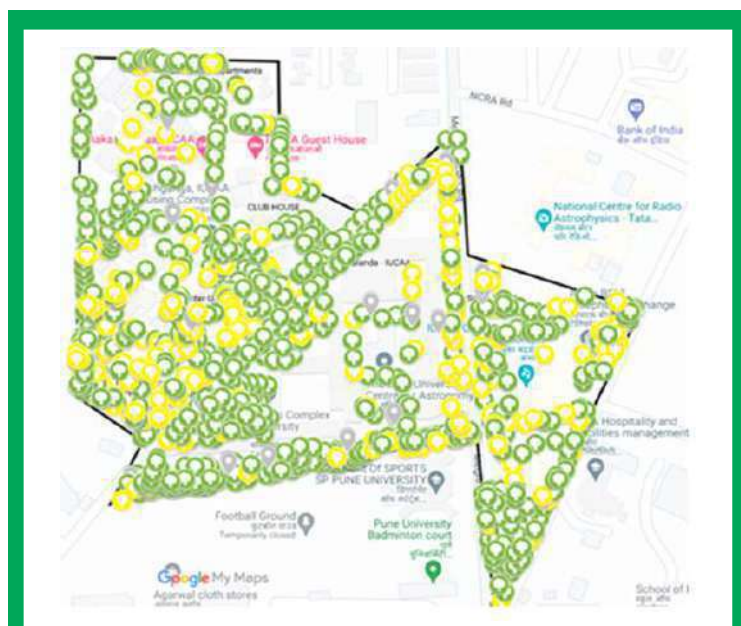


Fig. 5 : Carbon sink accounting for a campus done as part of the Carbon Neutral Campus Initiative



## POLICY ADVOCACY

PKC works with in-house experts and external agencies to create vision documents and action plans to enable development of sustainable solutions for environmental problems.

Key initiatives include:

- Sustainable Water Action Plan for PMR
- National Biomass Policy Document

### Sustainable Water Action Plan for PMR

PKC is working towards developing a Sustainable Water Action Plan (SWAP) for PMR. The plan will involve creation of a digital water platform and policy recommendations for water conservation and water security for PMR. The plan will be drafted by a consortium of stakeholders including researchers, government officials, urban planners and environment experts through understanding of biophysical, socio-economic and governance features of water including usage, discharge, availability and climate change impacts.

#### Key Beneficiaries of the SWAP:

- **Administrators & Policy Makers:**

It would act as a decision support system where all information regarding water (availability, use, discharge), land use (with land use change), human habitation, economic activities, climate change vulnerability, etc. will be available at both macro and micro levels. The tools and systems can be used by decision makers to plan, synergies and deploy resources more efficiently.

- **Industries:**

It will help the private sector (existing and upcoming industries) understand their socio - economic - environmental impact at macro and micro level. The private sector would benefit through the knowledge of availability/limitations of resources and can help in maximizing and securing returns on investments.

- **Research and Education Institutions:**

Knowledge of river basin problems and availability of data to address the problems can help undertake pointed research and education activities and develop implementable technologies.

- **Civil Society Organizations:**

Knowledge of ongoing schemes/ programs/ initiatives of public and private sector and other organizations can help maximize outputs.

- **Citizens:**

Knowledge of water availability can help invest in housing and businesses with better potential for return.

#### Status :

An outline of the Pune Metropolitan Region divided into 11 micro watersheds has been prepared using a river basin approach (i.e., watershed, catchment, and zone of influence) (Fig. 6). The Action Plan will prescribe solutions to problems within each minor watershed.



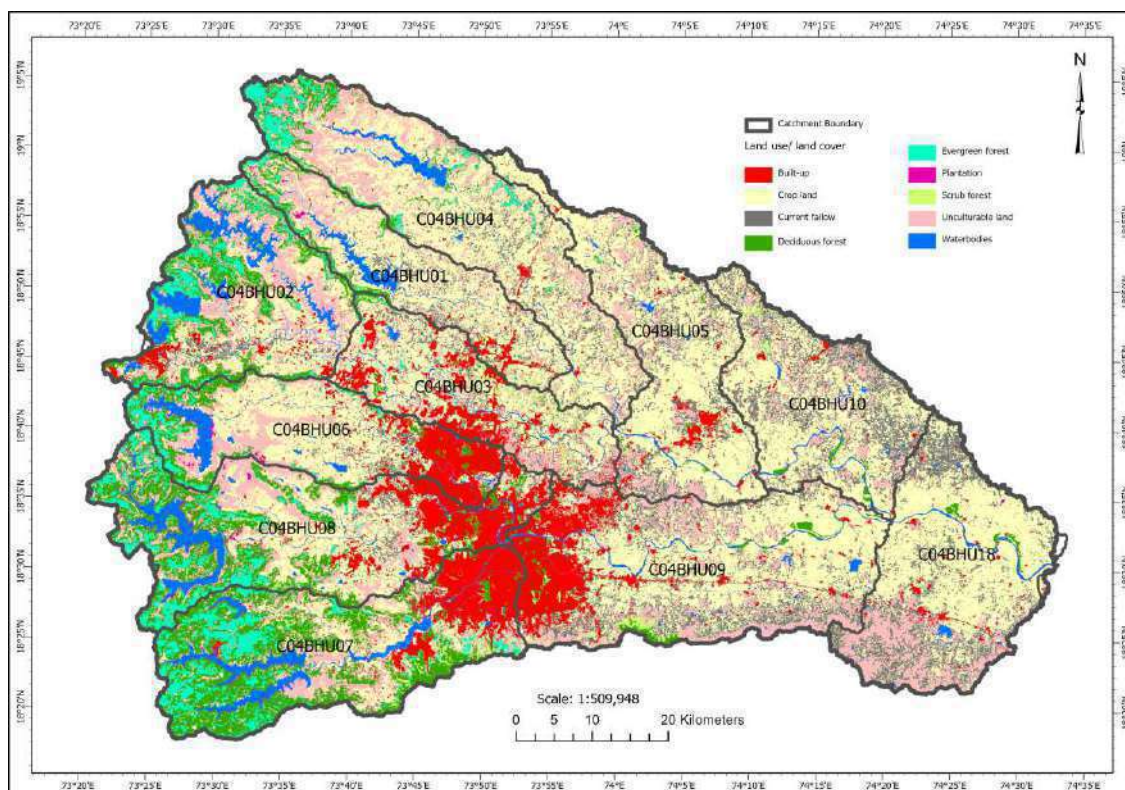
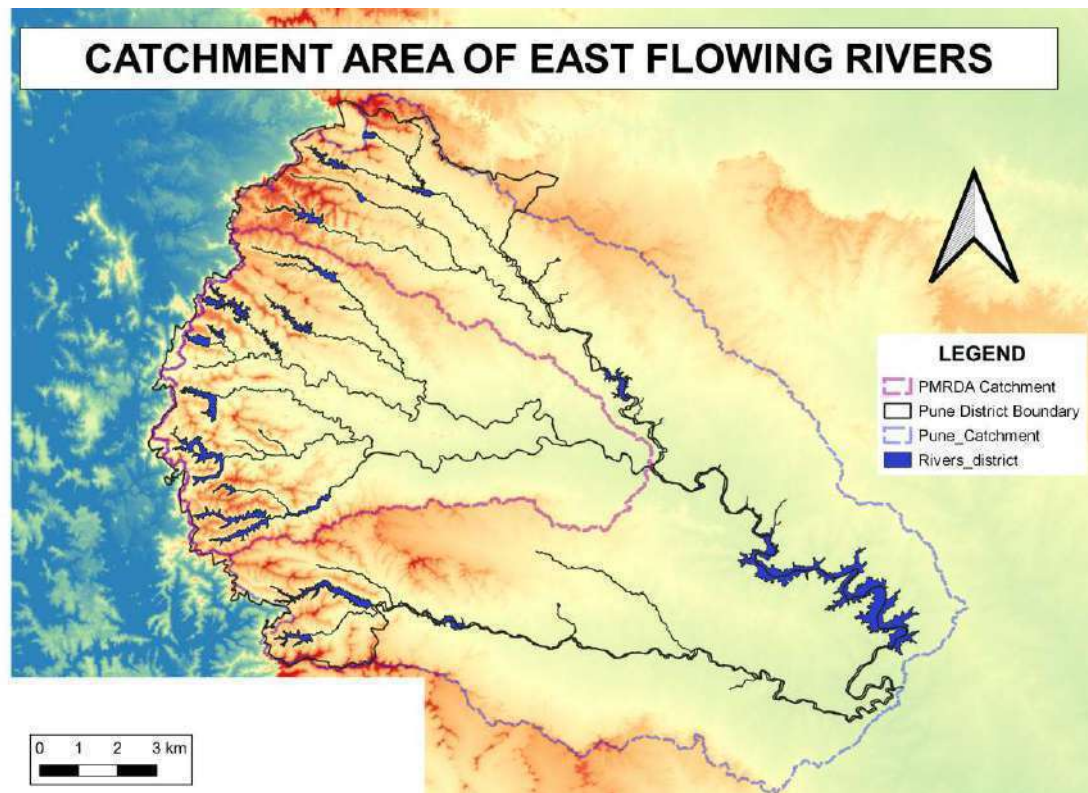


Fig. 6 Outline of the Pune Metropolitan Region based on a river basin approach (The area shown in the maps above, comprises PMC, PCMC, PMRDA, municipal councils, cantonments, towns and rural areas)

PKC is actively working as a knowledge partner with the local administration (Pune Municipal Corporation and Pune Zilla Parishad) for technology evaluation, project feasibility studies, and creating water conservation plans for water-stressed villages identified by the Pune Zilla Parishad. As a pilot PKC has chosen one severely water stressed villages (Washere, Khed Teshil, Pune District - Fig. 7) to prepare a water action plan for increasing water conservation.

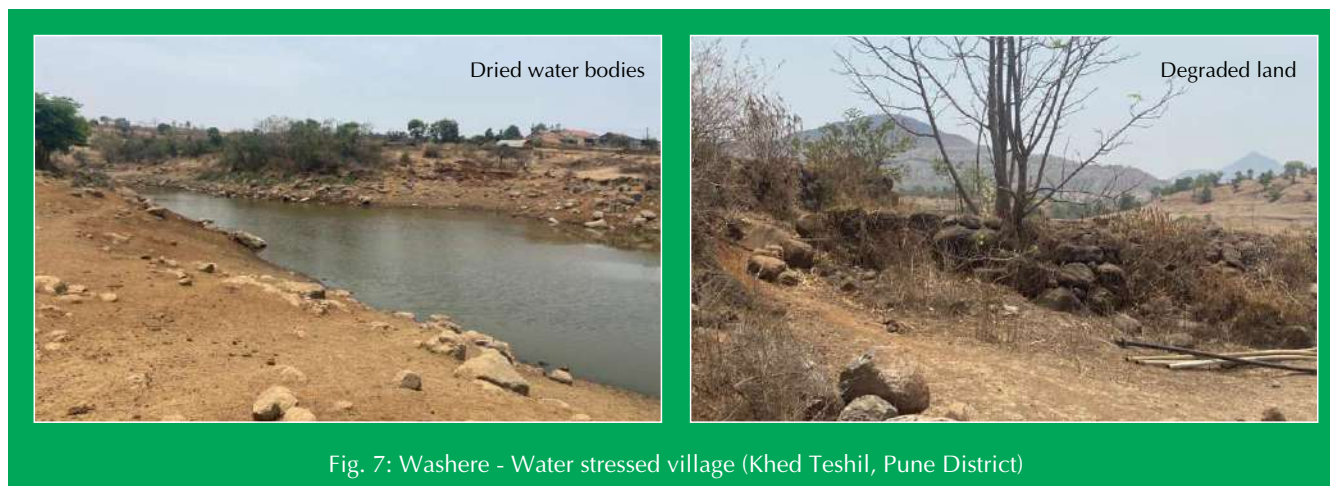


Fig. 7: Washere - Water stressed village (Khed Teshil, Pune District)

## Development of a National Biomass policy

PKC is preparing a National biomass Policy that aims to increase biomass availability for biofuels, energy resources for power generation, agriculture (fertilizers), timber, nutrition, and micro-entrepreneurship. The policy will promote increasing biomass on uncultivated and degraded lands, both public (forests and village) and private (farms, industrial, and mines), watersheds and catchment areas of wetlands and rivers. This policy will lead to accelerated development and utilization of bio-fuels thus serving the objectives of the National Policy on Biofuels, 2018 announced by the Government of India.

## Partners

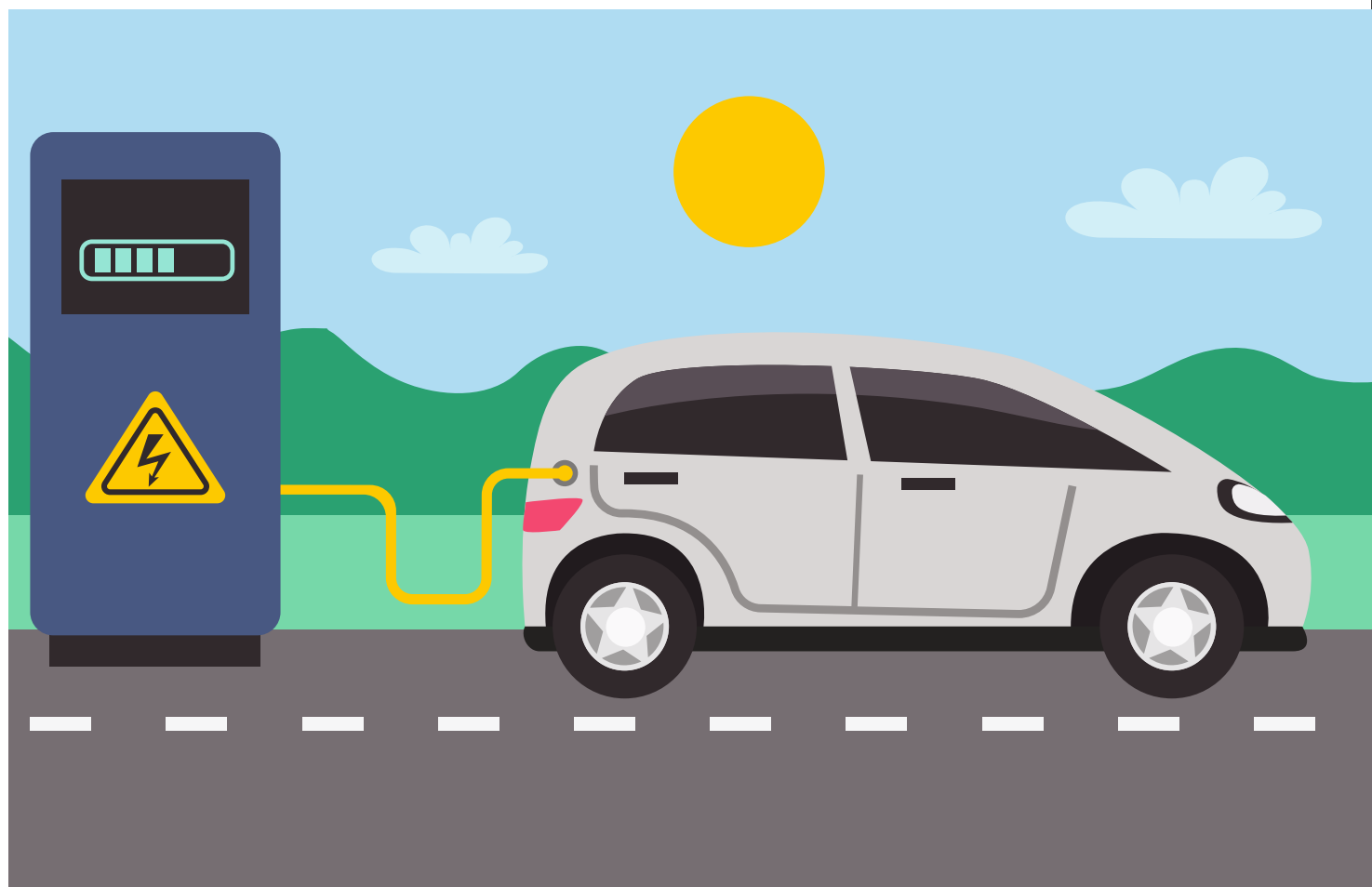
### Funding Partners



### Program Partners



## Sustainable Mobility



“Conversion of India's vehicles to electrical vehicles has a potential to save fossil fuels worth about \$100 bn annually, which in turn would save the country precious foreign exchange, prevent the dependence on imported petroleum products and reduce the pollution in cities by 80 - 90%.”

**Shri. Piyush Goyal,**

Union Minister of State (IC), Power, Coal, New & Renewable Energy & Mines,  
- At The World Conference on Environment 2017

According to ‘India 2020 - Energy Policy Review’, published by International Energy Agency (doi: 10.1787/9faa9816-en), the Indian transport sector accounts for 13.5% of the country's energy-related carbon dioxide emissions, with road transport accounting for 90% of the sector's final energy consumption. Other than greenhouse gases, the transport sector is also a major emitter of several toxic gases such as Nitrogen Oxides (NO), which cause local air pollution, resulting in the prevalence of adverse health effects and premature deaths, especially in urban areas. With growing needs of the population, it is crucial to adopt large scale measures for clean mobility. The Pune Knowledge Cluster in collaboration with local civic authorities, research institutions, and think tanks, is working towards promoting modes of sustainable mobility in the Pune metropolitan region.





Projects of this vertical align with:



## NATIONAL MISSIONS

- National Electric Vehicle Mission
- National Electric Mobility Mission Plan (NEMMP) 2020
- National Mission on Transformative Mobility and battery Storage
- Waste to Wealth Mission
- Smart City Mission

## SUSTAINABLE DEVELOPMENT GOALS



## Objectives

- To apply scientific and technical tools to address the rapidly growing and changing mobility requirements of the city.
- To support the development of sustainable solutions for carbon - neutral transportation.

## Highlights

- A technical and financial analysis of EV potential for Pune city prepared as part of a commissioned study
- A brainstorming workshop for building vehicular E-waste recycling capacity conducted in which over 30 stakeholders including civic bodies, industries and research institutions in Pune participated.

## Activities

- Technical & Financial Analysis Of EV Potential In PMR
- Initiatives to promote Vehicular E-Waste Recycling

## Technical & Financial Analysis of EV Potential in PMR

- Through a study commissioned by The Pune International Center, PKC prepared a comprehensive report on technical and financial feasibility of electric vehicle potential in the Pune Metropolitan Region. The objective of this report was to provide an overview of key traffic routes and potential areas for installing EV charging stations and to calculate the potential and feasibility of Renewable Energy powered charging stations for EVs. The report is a part of a larger Action Plan for implementing Carbon Neutrality measures in PMR. This report includes the following:
- Feasibility of converting Buses and Trucks to EVs and other low carbon technologies
- Assessment of 2W, 3W, and 4W conversion potential to EVs in PMR
- Assessment of the potential to integrate low-carbon public transportation in PMR

## Initiatives to promote Vehicular E-Waste Recycling

PKC is conceptualizing projects with technology providers and the auto industry to pilot novel technologies for vehicle E-waste recycling at the city level through public-private partnership models.

### Activities

- Identify feasible technologies for recovery of Lithium and precious metals in batteries, catalytic converters in a cost effective and safe manner
- Develop an E-waste Management Center (Demo Unit) to demonstrate technical and economical feasibility of novel technologies

### Intended impact

The demonstrative unit will have capabilities for segregation, shredding, chemical processing and material recovery (Lithium, Cadmium and others) and piloted technologies will be available for commercial use.

### Progress

Pune Knowledge Cluster and Automotive Research Association of India (ARAI) co-organized a workshop on “Developing Action Plan for Automotive E-Waste Management & Recycling” at ARAI Pune on 2 July 2022. Panel discussions were held on the challenges & possible solutions for E-waste Management in Pune city involving civic bodies, industries & research institutions. (Fig. 1).



Fig. 1: Workshop on “Developing an Action Plan for Automotive E-Waste Management & Recycling”, 02 July 2022 co-organised by PKC and ARAI Pune. Participants included- Members of Local civic bodies (Pune Municipal Corporation, Regional Transport Office, Pimpri-Chinchwad Municipal Corporation Pune Smart City Development Corporation Limited), Industries (Mercedes Benz India Pvt. Ltd, Mahindra CERO, Attero Recycling, Exigo Recycling, Delhi, Tata Chemicals, , Eaton, Frost & Sullivan, Reteck Envirotech Pvt. Ltd., Exide Industries Limited, Second life Li-ion Batteries, Nunam, Badve Enginnering Ltd, Green IT recycling, ANTAL International, Badve Enginnering Ltd, Nile Limited) and Research Institutions (ARAI Pune, Physics Department Savitribai Phule Pune University, CSIR NCL, CMET, Hyderabad).

## Partners





## Big Data and AI



“India today is well-positioned to become a global leader in Artificial Intelligence (AI) and there is a need to adopt it across all sectors”.

**Shri. Amitabh Kant**  
Ex - CEO, Niti Aayog

Big data and Artificial Intelligence are slowly percolating in technological aspects of all sectors be it healthcare, education, agriculture, transport, or infrastructure. The application of AI for societal good has the potential to accelerate the growth of the Nation by multiple folds.

Pune Knowledge Cluster is currently involved in leveraging the immense potential of Big data and AI in various fields such as Health, Education, and Climate action through several innovative programs



Projects of this vertical align with:



## NATIONAL MISSIONS

- National Mission for Artificial Intelligence
- National Supercomputing Mission
- National Mission on Education through Information and Communication Technology (NMEICT)

## SUSTAINABLE DEVELOPMENT GOALS

### 03 GOOD HEALTH & WELL-BEING



### 09 INDUSTRY, INNOVATION AND INFRASTRUCTURE



### 17 PARTNERSHIPS FOR THE GOALS



## Objectives

- Facilitating open access to data - by developing state - of - the - art web - based platforms where scientists are provided with customized survey applications and citizens get access to scientific data sets (images/ plots/ handwritten documents) and a user interface to be able to analyze/ decode/ digitize data
- Increasing opportunities for interaction between the scientific community and the general public with a special emphasis on inclusivity via Citizen Science initiatives and public talks
- Promoting data science literacy via various capacity - building initiatives, industry - relevant training programs, and scholarship programs

## Highlights

### Crowd sourced data collection and analysis platforms developed for astronomy (Citizen Science)

- **Completed and publicly accessible: 1**
- **Under development: 2**
- **Citizens enrolled: 1000+**

### Crowd sourced data collection and analysis platforms developed for urban forestry (Citizen Engagement)

- **Completed and publicly accessible: 1**
- **Citizens enrolled: 100+**

## Activities

- Citizen Science Programs
- Development of Artificial Intelligence Platform for Biology and Chemistry
- Technologically enabling urban forestry efforts in Pune

## Citizens Science Programs

Scientific advancement in any field often encounters issues like enormous data size, instrumentation, computational constraints, a limited number of trained researchers, etc. Artificial intelligence (AI) appears as a possible solution for dealing with gigantic datasets. However, AI can be efficiently employed, only if the preliminary requirement of a large number of training datasets and trained analysts is fulfilled. Here the power of crowdsourcing or citizen science can be utilized.

Citizen science is the practice of public participation and collaboration in scientific research. Through citizen science programs, the general public share and contribute to data collection, monitoring, and analysis. PKC aims to involve enthusiastic volunteers from the public to perform data analysis and build such training datasets.

## ONGOING PROJECTS

### One Million Galaxies

Images of the universe have the power to kindle curiosity in people from all walks of life. PKC's first citizen science project is based on image analyses of Galaxy images from a Japanese Telescope 'Subaru'. Astronomy enthusiasts from the public are trained by expert astronomers to identify nuanced features of the galaxy images and then provided with an intuitive user-interface to mark the peculiarities (Fig. 1). The project is developed under the guidance of Prof. Ajit Kembhavi and Prof. Sudhanshu Barway (Indian Institute of Astrophysics, Bangalore).

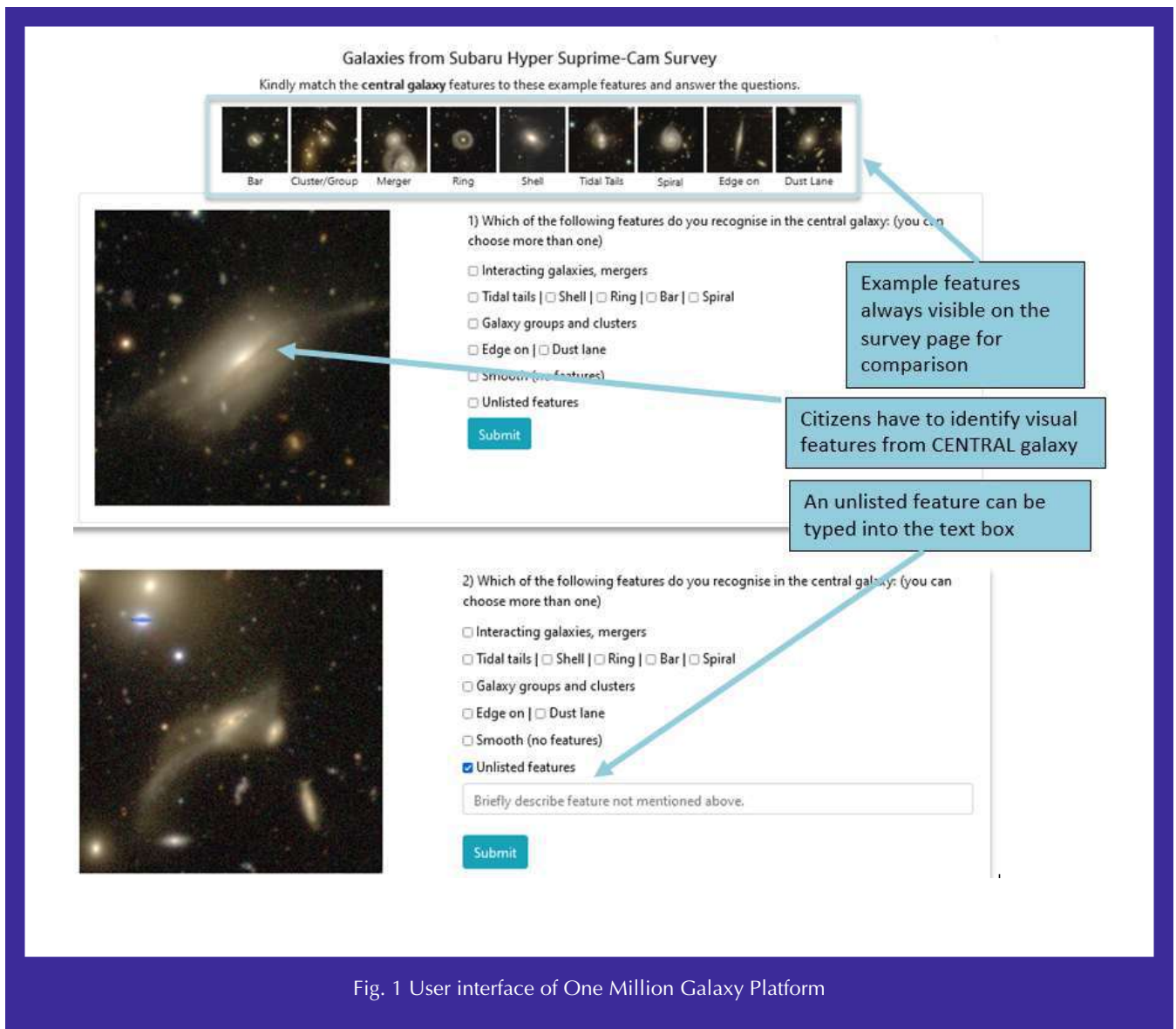
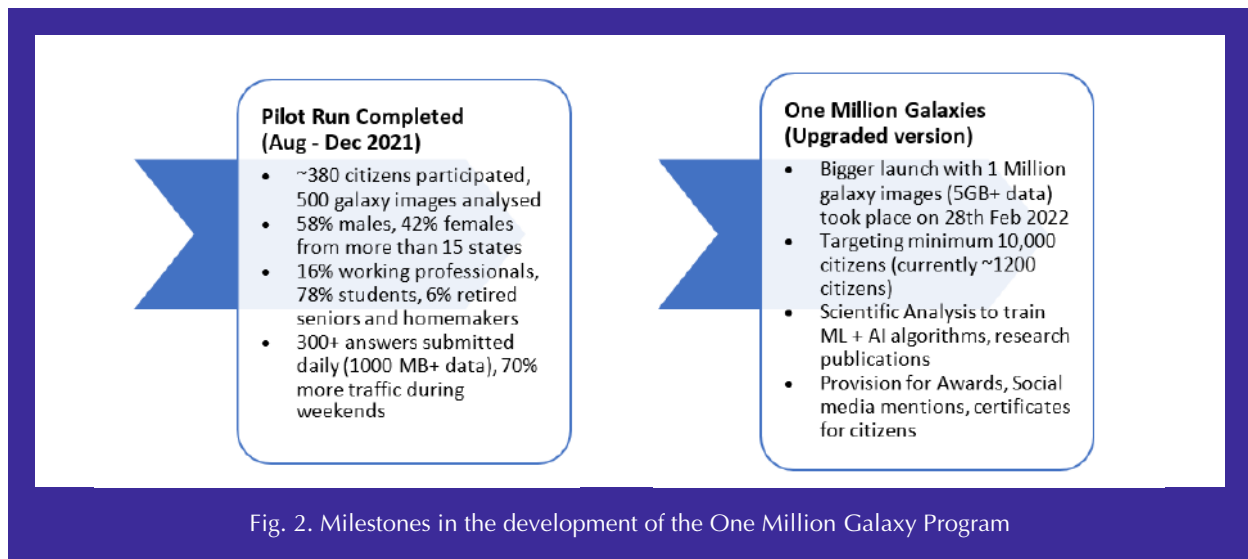


Fig. 1 User interface of One Million Galaxy Platform

### Activities

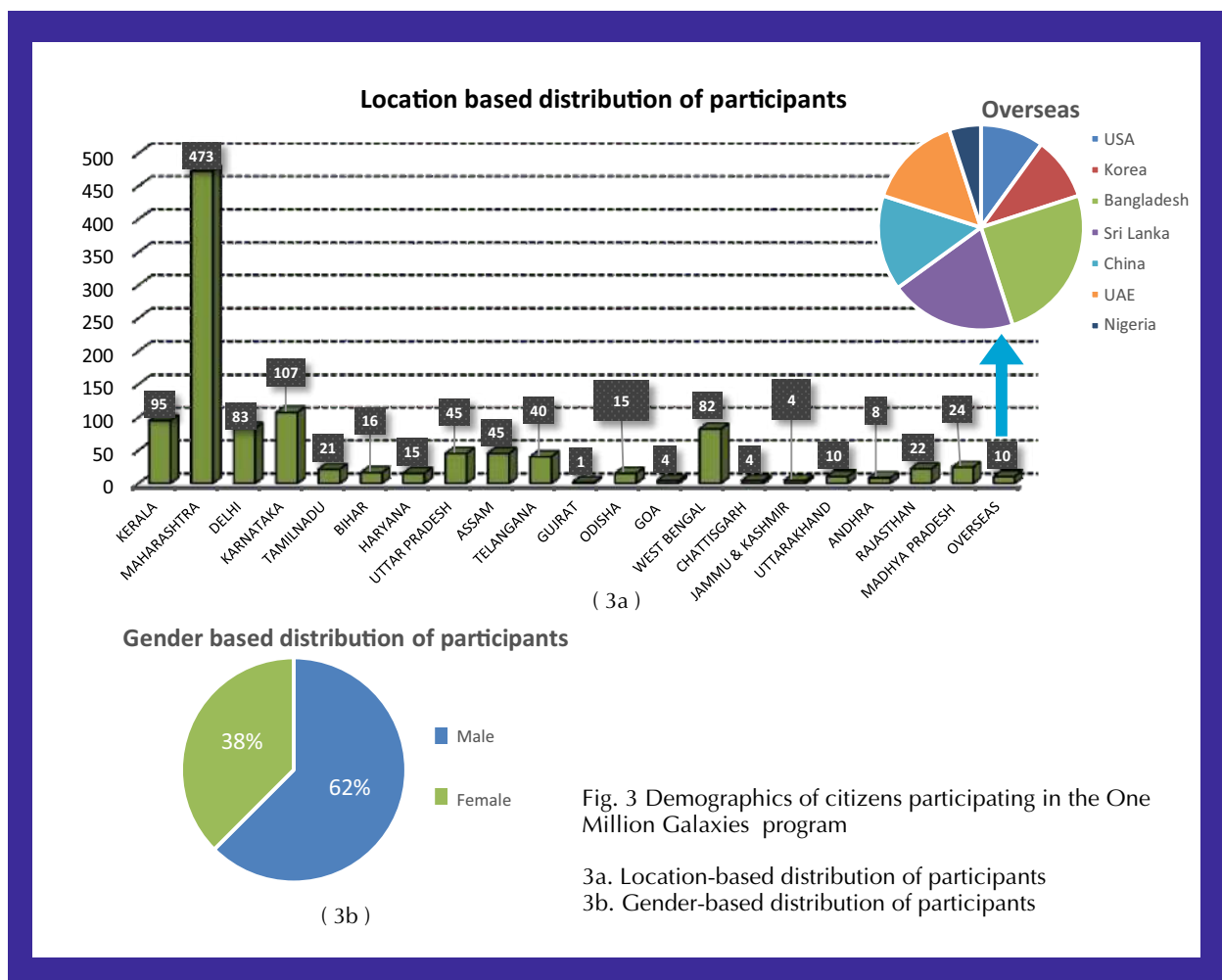
- Amateur astronomy groups and planetariums were sensitized about the program and interested citizens were onboarded.
- A pilot platform was developed for the citizens, after beta testing of the platform by a group of amateur astronomers and science enthusiasts, the platform was launched for the general public on National Science Day, 28th February 2022 ( Fig. 2) . The platform is accessible at <https://csa.pkc.org.in/>





### Progress

- More than 1000 citizen-scientists have enrolled on the platform from India & overseas (Fig. 3 (3a, 3b))



- Around 80,000 features from galaxy images have been identified until the end of July 2022. (Fig. 4)

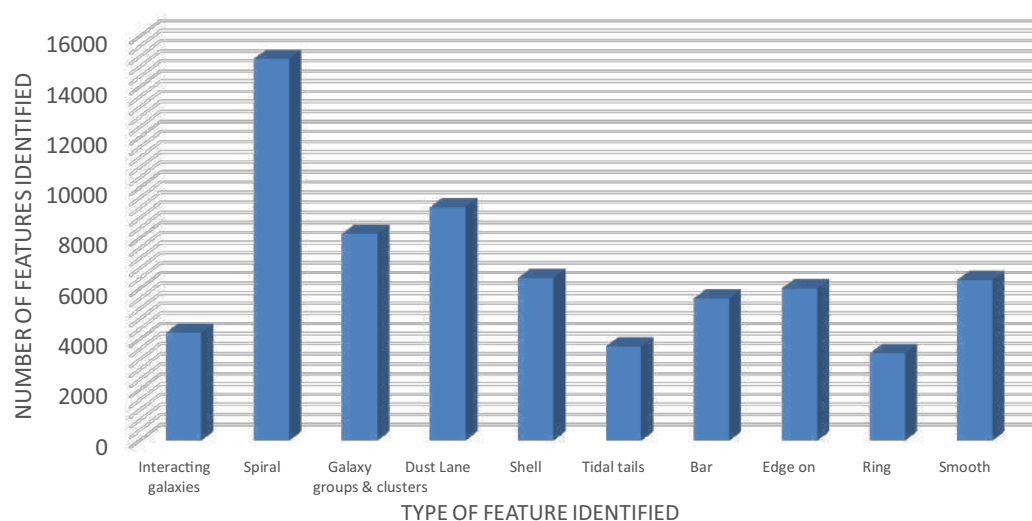


Fig. 4. Galaxy features identified using One Million Galaxies

## Highlights

### Various podiums where the program was invited to be presented:

- Workshop on “Brainstorming pandemic-era outreach methodologies in astronomy and related fields” organized by Indian Institute of Astrophysics, Bangalore on 2-3 August 2021.
- State Level Amateur astronomer’s meet organized by APJ Abdul Kalam Astro-space and Science Centre in Aurangabad on 7-8 May 2022.

## Acknowledgments

### The team members have been acknowledged for their contributions:

- Dr. Disha Sawant was invited on the discussion panel for Multi-stakeholder Roundtable on Citizen Science Policy and Practices in India organized by DST - Centre for Policy Research - IISc, Bengaluru, 10 May 2022.
- Atharva Bagul (IISER Bhopal), Research Assistant - One Million Galaxies won a “Citizen Science Fellowship” by EarthWatch India worth INR 1 Lakh.

## Projects in pipeline

### 1. Quest for Quasars

Moving beyond images and slightly towards complex kinds of datasets, we would like to explore variability in Quasars (Active Galactic Nuclei) by studying their spectral features. A pilot platform is being designed in collaboration with Prof. Vivek M. from Indian Institute of Astrophysics, Bangalore, This project will focus on two tiers of citizens.

- **Type I:** Identifying quasar type using simple layout, simple question: for the general public
- **Type II:** Exploring the detailed features in absorption, and emission by quasars by comparing their multi-epoch spectra: for students with experience in astronomy (Fig. 5).

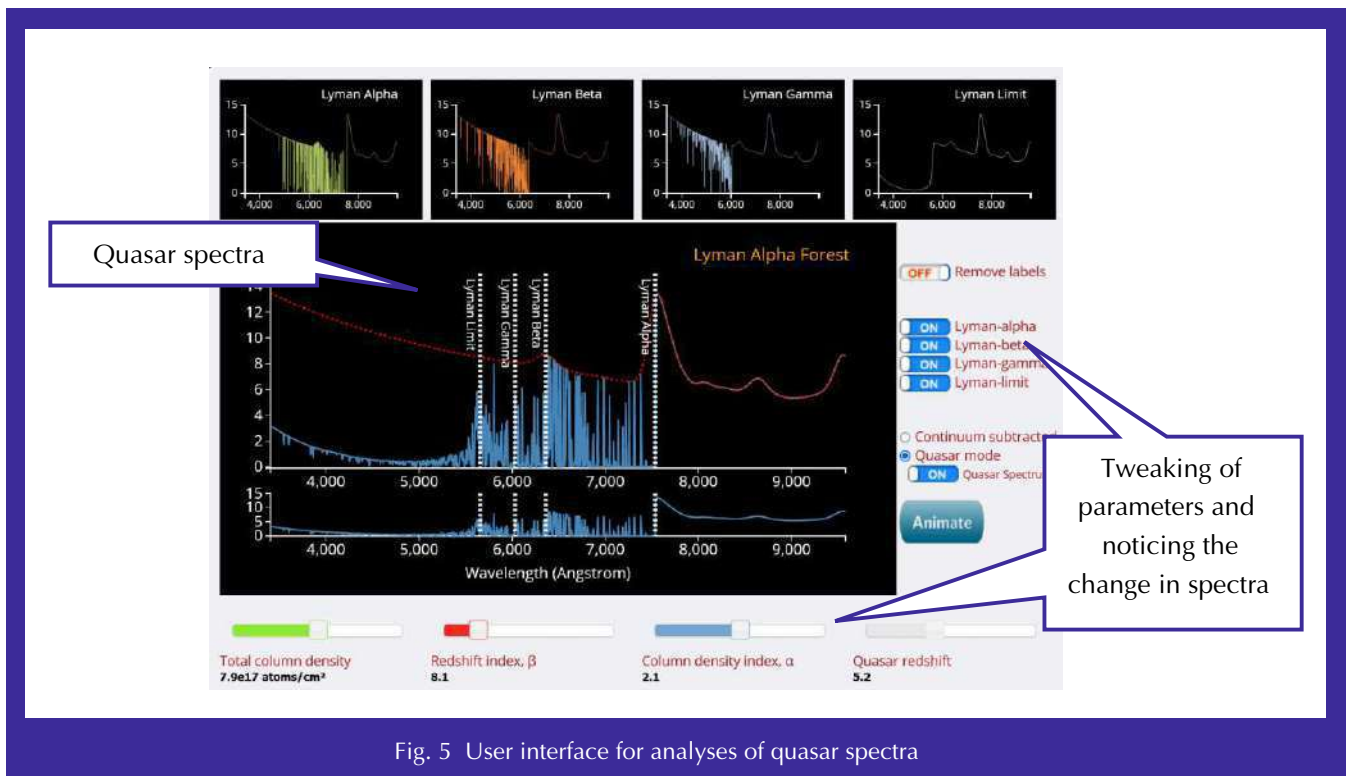


Fig. 5 User interface for analyses of quasar spectra

- A pilot-scale platform will be developed based on the feedback of the in-house astronomers
- The selection of niche students with astronomy backgrounds would begin in November 2022. Based on test cases and feedback, an upgraded version will be launched in January 2023

## 2. Discovery of exoplanets & Astronomy for inclusion

PKC plans to make another exciting citizen science program for the general public based on analysing data for the search for exoplanets i.e. habitable planets beyond Earth. PKC will collaborate with Dr. Ravi Kopparapu, planetary scientist, NASA Goddard Space Flight Centre who is an expert in exoplanet research to develop this project.

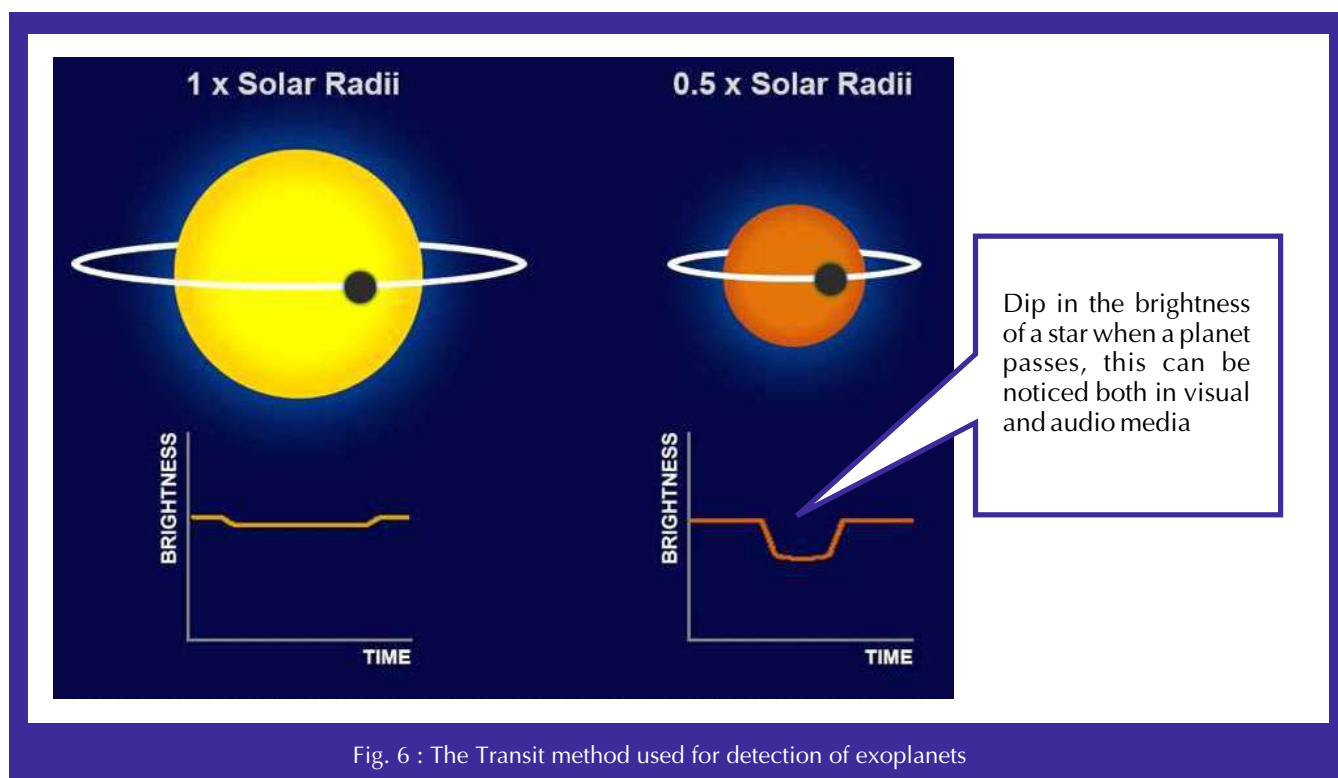
When observing emissions from a star, usually there is a dip in the brightness observed when a planet transits in front of its host star. This dip in the stellar spectra can be identified in two ways:

1. General public looking for the dip in the graphical data
2. The audio data from such stars getting analysed by visually impaired citizens where they identify changes/ gaps, empowering the visually impaired for astronomical data analysis

Researchers can convert various 2D datasets into audio using open access software developed by a visually impaired astronomer Dr. Wanda Diaz-Merced (European Gravitational Observatory Cascina) to complete the parenthesis. This technique is termed as 'sonification'. Using such audio clips, we can introduce basic astronomical concepts to the visually impaired. Since the data gets analysed using a different medium, it adds to the accuracy of the analyses.

Most importantly, it boosts the confidence of visually impaired citizens where their hearing capacity can be used as a resourceful asset in scientific research. This project is likely to commence in mid-2023.





### Planned activities

- Reach out to numerous science enthusiasts among the citizens via amateur clubs and societies
- Reach out to scientists from various domains to invite them to host the data for analysis
- Develop a platform for astronomical analyses for visually impaired citizens

## Development of Artificial Intelligence Platform for Biology and Chemistry

There are groups with expertise in data analytics and AI in various institutions and industries in Pune. Researchers from these groups have been collaborating with domain experts from biology and chemistry on problems of mutual interest.

These collaborations have led to significant development of tools, techniques, and publication of research papers which have been very well received by the community. To broaden the areas over which such collaborations can take place in a sustained fashion, and to provide a common platform for the purpose, PKC initiated a meeting of senior scientists from the National Chemical Laboratory (NCL), National Centre for Cell Science (NCCS), IISER-Pune and PKC in June 2022. These discussions led to the conceptualization of the program- Artificial Intelligence Platform for Biology and Chemistry. Additional experts from institutes and industries in Pune will be joining the program.

### Activities

The platform will enable biologists, chemists, and people with expertise in the application of AI to perform the following:

- Undertake problems in the broad areas of biology & chemistry which would benefit from the use of AI

- Conduct workshops and meetings with national and international experts to identify new areas in biology and chemistry where AI can make a significant contribution
- Conduct courses in data science and AI appropriate for students and young researchers in biology and chemistry as a part of skills development
- Conduct an internship program for undergraduate and masters level students from institutions and universities
- Create a website for the exchange of ideas, results, codes, and other development.
- Over time, scale the programme to other clusters and groups

### Progress

- A number of problems for applications of AI to Chemistry have been identified in discussion between PKC and groups in NCL and work on those has been initiated. Similarly, work on applications of AI techniques to biological problems has commenced with groups in NCCS
- Discussions have been initiated with the National Supercomputing Mission for the use of high-end supercomputing resources which would be needed for certain applications, like developing digital twins of pilot scale chemical plants
- Courses and workshops are being planned for the last quarter of 2022. Discussions have begun with some institutes for starting an internship program and funding sources are being approached for various parts of the program including skill development

## Technologically enabling urban forestry efforts in Pune

Drawing from databases related to urban morphology, land records, weather, and climate, soil types, vegetation and tree census, groundwater, etc, as well as agent modeling and crowd-sourced information, 'ConnecTree' is capable of enhancing the synergy and efficiency of plantation drives conducted by citizens, corporates and civic bodies.

### Intended Impact

- Increased survival of plantations in urban public places
- Improved conservation efforts through interaction between citizens and civic bodies

### Progress

- No. of saplings brought under tracking / IT platform: 200
- Survival Rate of sponsored saplings: 70%



ConnecTree platform is publicly available at: <https://bit.ly/3ff1arL>

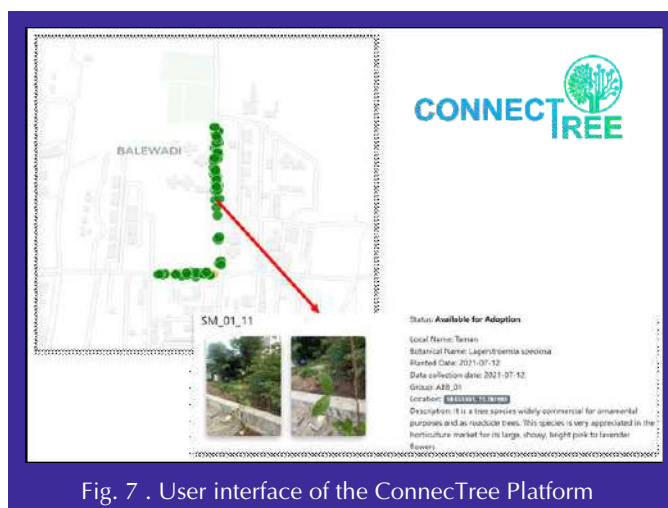


Fig. 7 . User interface of the ConnecTree Platform

## Partners

### Funding Partners



### Program Partners



# CAPACITY BUILDING



How nations develop their human capital can be a more important determinant of their long-term success than virtually any other factor.

## **The Global Human Capital Report 2017** (World Economic Forum)

According to the Periodic Labour Force Survey (PLFS) 2017-2018, conducted by the Ministry of Statistics and Programme Implementation, GoI, India will have a total workforce of 404.15 million people, with around 70 million individuals of working age (15-59 years) by the year 2023. To ensure that a large portion of the task force is employable, there is an urgent need for skill development as per contemporary industry needs.

India is on its way to becoming a major global knowledge-based economy. Development of skills pertaining to Science Technology, Engineering, and Mathematics (STEM) amongst youth is needed to achieve this goal. Recognizing this requirement, the Pune Knowledge Cluster is working towards providing opportunities to students, educators, young researchers, and professionals to improve their knowledge base and acquire advanced skills through interdisciplinary training programs.





PKC in collaboration with industry and academia conducts capacity-building programs aligning with its various verticals namely Health, Environment, Sustainable Mobility, Big Data, and Artificial Intelligence. PKC's prime focus is to bridge the knowledge gap between skills acquired through conventional education and that required by industries and research institutions. PKC is committed to empowering STEM education in schools and colleges through various pedagogical programs and outreach activities.

Through its various initiatives, PKC's Capacity Building vertical aligns with several SDGs, national missions, and national policies.

Projects of this vertical align with:



## NATIONAL MISSIONS

- National Education Mission
- National Mission on Education through Information and Communication Technology (ICT)
- National Education Policy 2020

## SUSTAINABLE DEVELOPMENT GOALS

### 04 QUALITY EDUCATION



### 17 PARTNERSHIPS FOR THE GOALS



## Objectives

- To facilitate high-end skilling and knowledge enhancement in youth by conducting interdisciplinary training programs & courses
- To promote scientific temperament in society by hosting citizen centric science talks by experts
- To promote STEM education via training programs on digital literacy and 21st century skills for students, pedagogy training programs for teachers, and scholarships & mentorship programs for girls students and entrepreneurs in STEM

## Highlights

### **Number of Inter-disciplinary Training Courses conducted : 12**

Beneficiaries : 668                      Mentors involved : 115

### **Number of Inter-disciplinary Training Workshops conducted : 2**

Beneficiaries : 62                      Mentors involved : 11

### **Number of Citizen-centric Talks conducted : 49**

Beneficiaries : 4859

### **Funds raised for STEM Programs: INR 86 Lakhs**

## Activities

Various activities conducted under the capacity building vertical include:

- Citizen-Centric Science talks
  - Special Talks
  - India S&T@75 series
  - Domain-Specific Talks
- Interdisciplinary Training Programs & Courses
- STEM Initiatives



## Citizen-Centric Science Talks

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### Impact:

A total of 49 talks have been hosted by PKC which have been attended by more than 4800 individuals. All the talks are available on PKC's official YouTube channel which can be used as a knowledge repository as per the learning requirements of the audience /subscribers.

### Special Talks

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#### **Dr. R Mashelkar**

(Former Director - General of the Council of Scientific and Industrial Research (CSIR), President of Indian National Science Academy (2004-2006), President of Institution of Chemical Engineers (2007) and also the President of Global Research Alliance (2007-2018). First Chairperson of Academy of Scientific and Innovative Research (AcSIR). Fellow of the Royal Society, Fellow of the Royal Academy of Engineering (FREng), Foreign associate of US National Academy of Engineering and the US National Academy of Sciences.)

**Title of the talk : Sustainable Inclusive Growth through Gandhian Engineering**  
**Held on : 2<sup>nd</sup> October 2020**

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#### **Lieutenant General by (Dr.) Madhuri Kanitkar**

PVSM, AVSM, VSM

**Title of the talk : My Journey: In Search of Research**  
**Held on : 30<sup>th</sup> January 2021**

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#### **Prof. Raghavendra Gadagkar**

DST Year of Science Chair Professor, Centre for Ecological Sciences, Indian Institute of Science (IISc), Bangalore

**Title of the talk : Can We Learn from Insect Societies?**  
**Held on : 10<sup>th</sup> July 2021**

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#### **Dr. Gagandeep Kang**

MD, PhD,  
 FASc, FNASc, FNA, FRCPath, FAAM, FPH, FRS

**Title of the talk : Prevention is Health and Wealth**  
**Held on : 30<sup>th</sup> October 2021**

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## India S&T@75 Series

### CELEBRATING 75 YEARS OF INDIA'S S&T JOURNEY

As a part of the "India S&T@75" events during the countdown to the 75th year of India's independence, PKC in association with the Indian Academy of Sciences organized a number of lectures on scientific topics. These lectures were delivered by Fellows and Associates of the Indian Academy of Sciences. The lectures covered a wide variety of topics, highlighting some of the cutting edge science and technology developments made in the country over the past 75 years.

10 webinars have been conducted under the "India S&T@75" series.

Date	Topic	Speaker
19 <sup>th</sup> June 2021	Statistical Search for a Genetic Connection Between Tobacco & Oral Cancer	Prof. Anil Gore
26 <sup>th</sup> July 2021	Mathematical Physics & Reality	Prof. Sunil Mukhi
14 <sup>th</sup> Aug 2021	Conserving Biodiversity, Towards a Scientific Approach	Prof. Madhav Gadgil
11 <sup>th</sup> Sept 2021	Planning for a Clean & Green Tomorrow: Options and Opportunities	Prof. Satishchandra Ogale
9 <sup>th</sup> Oct 2021	The Indian Monsoon & its Variability	Prof. Sulochana Gadgil
13 <sup>th</sup> Nov 2021	Nature & Nurture: How the Environment Shapes our Genes	Prof. Sanjeev Galande
22 <sup>nd</sup> Jan 2022	Building Science Park: Exploratory, Innovative Space for Experiential Learning	Prof. Dilip Kanhere
9 <sup>th</sup> April 2022	M N Saha & S S Bhatnagar as pioneers of Research & Development in India	Prof. Arun Grover
28 <sup>th</sup> May 2022	Phase transition in spaces of non-integer dimensions : Fractals	Prof. Deepak Dhar
9 <sup>th</sup> July 2022	Evolution, Energetics & Environment of Energetic Explosions	Dr. Poonam Chandra





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**PUNE KNOWLEDGE CLUSTER AND INDIAN ACADEMY OF SCIENCES PRESENTS**  
**INDIA SAT @ 75 LECTURE SERIES**

LECTURE 2

## MATHEMATICAL PHYSICS AND REALITY

---

Mathematical Physics is sometimes thought of as a realm of abstruse speculation disconnected from experimental reality.



Using history as a guide, Prof. Sunil Mukhi will show that quite the opposite is true – considerations of theoretical and mathematical consistency have expanded and even predicted many important experimentally observed phenomena over the past century; these include objects like elementary particles and black holes, as well as properties like phase transitions and novel transport properties.





**PROF. SUNIL MUKHI**  
 Fellow,  
 Indian Academy of Sciences

**MONDAY, JULY 26, 2021**

**11:00 AM**

**JOIN LIVE**






**PUNE KNOWLEDGE CLUSTER & INDIAN ACADEMY OF SCIENCES PRESENT**  
**INDIA S&T @ 75 LECTURE SERIES**

# STATISTICAL SEARCH FOR A GENETIC CONNECTION BETWEEN TOBACCO & ORAL CANCER


Discovery of BRCA1 and 2 genes which make a female prone to breast cancer, a well-known story. Angelika Jost, a Hollywood superstar, made it to the cover of Time magazine because of it. Dr. Devanandya Banerjee, an expert on cancer genetics, based in Mumbai, has devoted an enormous amount of effort and resources to generate data hoping for a similar discovery in the case of oral cancer among Indians who chew tobacco. She gathered data on 1000 habitual tobacco chewers (half suffering from oral cancer and the other half free from it) and examined a set of genes which according to her, millions, are likely candidates for genes responsible for oral cancer. The basic idea is to contrast oral cancer positive and negative groups in terms of their genetics.

The lecture describes various steps in statistical analysis of these data leading to a strong suggestion that a single gene or possibly a small group of genes may be responsible for oral cancer. Methods of analysis are elementary.

**19th June 2021 | 11.00 am**

Join live on   and 

**Prof. Anil Gore**  
 Fellow, Indian Academy of Sciences





## COVID-19 DATA AND ANALYSIS


**TUESDAY  
AUGUST 24, 2021  
4.00 PM (IST)**



**Speaker  
Dr. JOY MERWIN MONTEIRO**  
Dept. of Earth & Climate Science,  
IISER Pune, India

The Pune Knowledge Cluster (PKC) has been established by the Scientific Advisory Committee of India. The aim is to bring together the industry of Pune and its surrounding regions to create a cluster of the region through innovative means, using various engaging digital resources.

## A LIVE WEBINAR ON MACHINE LEARNING & ARTIFICIAL INTELLIGENCE FOR GEOSCIENCE APPLICATIONS



The growth of data science, machine learning and deep learning has opened several new research avenues in the Geosciences, which has rich spatiotemporal datasets and physics-based models. We focus on recent applications of machine learning in satellite oceanography, human-wildlife conflict, mapping of autonomous vehicles, etc.

**DR. DEEPAK SUBRAMANIAN**  
Assistant Professor,  
Dept. of Computational & Data Science,  
The Indian Institute of Science (IISc),  
Bangalore

Dr. Deepak Subramanian is an Assistant Professor, Dept. of Computational and Data Science, Indian Institute of Science (IISc) in Bangalore. He obtained his Ph.D. in Mechanical Engineering, M.S. in Computational for Design Optimization, both from the Massachusetts Institute of Technology (MIT), USA. He has a B.Tech. in Mechanical Engineering and M.Tech. in Engineering Optimization from IIT Madras. He is an expert in data-driven modeling, numerical optimization, and scientific computing. His research focus is on using ML/AI for geoscientific applications, climate studies, uncertainty quantification, and optimal routing of autonomous vehicles.

**MO  
15TH NOVEMBER  
TIME : 4:00 PM**

## PREVENTION AND CONTROL OF HYPERTENSION




The World Health Organization attributes hypertension, or high blood pressure, as the leading cause of cardiovascular mortality. It has been recognized that more than 50 percent of the hypertensive population worldwide are unaware of their condition.

To address this problem, the World Health Organization initiated a global awareness campaign on hypertension in 2017, dedicated May 17 of each year as World Hypertension Day.

In India, around 25 percent of the population above the age of 45 years are diagnosed with hypertension. The prevalence was higher in senior citizens (above 65 years) than in the 45 to 59 years age group.

The prevalence of hypertension (36 percent) among the population was also higher in living than in those who had died.



**DR. HARSHAL PANDVE**  
Professor & Head,  
Dept. of Community Medicine (PSM),  
PCMC's PGI-YCMH, Pimpri, Pune

Dr. Harshal's insight on the prevention and control of hypertension is a step in helping us understand the disease, raise awareness and acknowledge the dangers of hypertension.

The Pune Knowledge Cluster (PKC) has been established by the Office of the President, PCMC's PGI-YCMH, Pimpri, Pune. The aim is to bring together academia, R&D institutions and the industry of Pune and its surrounding regions to create a cluster of the region through innovative means, using various engaging digital resources.

## TARGETED MOLECULAR PROFILING New era for Precision Medicine

Precision medicine is fundamentally changing the health care globally. To treat particular disease like cancer, this approach uses the individual's genomic information to personalize and tailor targeted treatment for maximum effectiveness, and minimize toxicity to that individual patient, unlike traditional "one size fits all" approach.

Hence, translational genomics approaches from bench to bedside is shaping the promise of Precision medicine [personalized, predictive, preventive, and participatory].


**Date  
Time :  
Join Live  
zoom**

## A LIVE WEBINAR ON BIG DATA & THE SQUARE KILOMETER ARRAYS (SKA) TELESCOPE

**TUESDAY, 21 SEPT. 2021  
4:00 PM**


Astronomy is facing a tsunami of new data within this decade. Within this vast sea of data (needles in the haystack) as well as even billions of celestial objects, the SKA telescope ever envisioned. It is now under construction (includes India) at two remote sites in South Africa and Australia.

Prof. Yogesh Wadadekar will discuss the challenges together to understand and solve the problems of transport, processing, delivery and storage of this vast data.



**SPEAKER:  
PROF. YOGESH WADADEKAR**  
National Centre for Radio Astronomy

## NATIONAL SCIENCE DAY PROGRAM ELECTRIC & SUSTAINABLE MOBILITY



A sustainable transportation system is the need of the hour and it needs to be identified, discussed, popularised, and practised.

Government policies and mandates have resulted in increased adoption of Electric Vehicles (EV) as the future of transportation.

In this context, an expert session is being arranged to deliberate and enlist the best practices being followed by different key players working in the field of sustainable electric mobility. The program on the occasion of National Science Day aims to create awareness about Electric Vehicles and Ecosystems.

**DATE :  
26TH FEBRUARY 2022**

**TIME :  
11 AM TO 12.30 PM**

**JOIN ON :  
zoom**

**OUR SPEAKERS**

**DR. RAHUL WALAWALKAR**  
Founder & President, India Energy Storage Alliance (IESA)  
President & CEO, Customised Energy Solutions India Ltd.

**DR. SUSHIL RAMDASI**  
Deputy Director, Powertrain Engineering Laboratory  
Automotive Research Association of India (ARAI)

**MR. MANOJ KUMAR D.**  
Deputy General Manager  
Mahindra & Mahindra India Corporation Limited Pune

**EVENT MODERATOR**

**MS. RASHMI UDHWALESHE**  
Senior Advisor  
Pune Knowledge Cluster

**DR. SUREKHA DESHMUKH**  
Chair  
PKC Industry Council

**DR. MANDAR BHAWALKAR**  
Chair  
PKC PGI-YCMH Chapter

**FOR MORE INFORMATION VISIT :  
www.pkc.org.in**

**CLICK HERE**



CE  
NDAY  
2021  
00 PM

A SPECIAL TALK ON

# DATA DEMOCRATIZATION

Data has emerged as the key resource of Digital Economy. Citizens, Organizations and Society at large will benefit from the democratization of data as it will become usable by anyone to derive insights out of it and build inclusive solutions for the development of our society.



**Speaker**

**Dr. Neeta Verma**

Director General, NIC

Dr. Neeta Verma is the Director General of National Informatics Centre, Delhi. She has been instrumental in the development of Digital India mission, through development of Digital India platform for Government and the working up of technology platform for Government, Private, Academic, & Research community.



Pune Knowledge Cluster (PKC) launches  
**SUST-EN Series**  
with a Virtual Public Talk on



## IMPORTANCE OF GREEN SPACES IN ALL BEING OF CITIZENS

Green areas in cities is essential for well being of citizens. It is various reasons such as environmental, aesthetic, emotional and over the world the major cities in Western countries have beautiful some cities have large parks of several hundred hectares. However areas are seriously lacking in Pune. In this talk a comparative made of green spaces in Pune vis-a-vis world standards.

**WEDNESDAY  
23RD MARCH 2022  
4 PM TO 5 PM**

**TO REGISTER  
SCAN QR CODE**



**SPEAKER**

Dr. Pratik & Tech and an M.Tech degree in Chemical Engineering from IIT (Mumbai). He joined Service (IPS) to pursue his interest in wildlife protection.

Dr. Pratik is a wildlife enthusiast. He received training in wildlife as an IPS officer in Maharashtra from the Indian Forest Service to Director of Conservation in several aspects of the forests of Western India. He is interested in policy formulation, conservation, photography, and



He is focused towards making Pune resilient in of this goal requires increasing vegetation cover, city can also help in climate change mitigation, forested carbon storage, reduced emissions of green, consists of public talks, focused group sessions and sustainability space. Through the use of technologies and conceptualization of city emissions, waste water treatment, improving

## IMPORTANCE OF EPIDEMIOLOGY FROM A PUBLIC HEALTH PERSPECTIVE

Epidemiology is, at its heart, the science of disease. It is the foundation of public health and is defined as the study of diseases in populations, investigating how, when, and why they occur. Today, epidemiologists use the insights gathered in their research to determine how illness within a population affects our society on a larger scale. This in turn, provides recommendations for interventions.

This talk will focus on the interdependencies of Public Health and Epidemiology. The speaker will address how a society/city/researcher burden, and pre-empt, and predict diseases. Epidemiologists utilize Data, Epidemiological Modelling, and Contact Tracing as the basis to track diseases.

**DR. PRAKASH DOKE**

Professor, Department of Community Medicine  
Director (Retd.), Health Services, Government of Maharashtra  
Bharati Vidyapeeth Deemed University Medical College, Pune



**TIME: 4 PM TO 5 PM  
DATE: 28TH JUNE 2022**

For registration  
Scan the QR Code or use the link:  
<https://bit.ly/380udPQ>



PKC's Health talk series aims to promote active discussions on emerging, tracking, mitigation, and understanding the impact of diseases of a city level. The series hosts talks, stakeholder meetings, and workshops to highlight health issues that plague the city and potential measures for their mitigation. It will also showcase research, and clinical and technological advances in the healthcare ecosystem.

[www.pkc.org.in](http://www.pkc.org.in)



PKC PRESENTS CONVERSATIONS WITH

## WOMEN ROLE MODELS IN STEM

### MY JOURNEY IN CHEMISTRY

सायनशास्त्रातील माझा प्रवास

- DR. SHOBHA WAGHMODE



**DR. SHOBHA WAGHMODE**  
Professor & Head  
Department of Chemistry  
MIS Abasaheb Garware College,  
Pune, Maharashtra

**THURSDAY  
30TH JUNE 2022  
4 PM - 5 PM**

TO REGISTER SCAN QR CODE



Dr. Waghmode is an academican and researcher whose research interests include: Graphene & core shell Nanomaterials, MOF, CO<sub>2</sub> capture & conversion, Metalloenzymes & Kinomzymes. She has successfully led and executed several projects with government agencies such as ISRO, DBT, UGC, BCCU. She has received several awards including the BEST Teacher Award from SPPU in 2019. She has mentored over 100 students for their MS and PhD projects over 28 years. She hails from Varkute Khurd, small town in Pune District from a family of farmers. She is also passionate about nature conservation and volunteers with NGOs for green city initiatives.

An initiative by The Pune Knowledge Cluster, which aims to bring forward the journey of women in various fields of Science, Technology, Engineering & Mathematics (STEM). This series is conducted in an informal conversational format to help the audience relate to the lives of successful women professionals in STEM, knowing first-hand about their success stories, their failures, and how they moved ahead to make a mark in their field. We hope this initiative will inspire young women to break gender stereotypes, societal barriers and encourage them to pursue careers in STEM.

[www.pkc.org.in](http://www.pkc.org.in)

## ADVANCED THERAPIES IN ONCOLOGY

Advancing Medicine



New data as a slew of new telescopes come online at datasets, astronomers will search for rare objects trace statistical trends with samples of millions and The Square Kilometre Array is the largest radio being built by an international consortium (which one in Australia and another in South Africa).

Describe how astronomers and engineers are working to solve challenging problems in data acquisition, visualisation of exabyte scale datasets.

**ADARSH DEKAR**  
Astrophysics - Tata Institute of Fundamental Research, Pune, India

## Domain-Specific Talks

### CODATA Talk series (BIG Data and AI)

PKC - CODATA Webinar series:

This webinar series is run in collaboration with CODATA - National Committee & The Indian National Science Academy. This series aims to promote Data Science outreach, and FAIR data advocacy.

Date	Topic	Speaker
20 <sup>th</sup> July 2021	Data Democratization	Dr. Neeta Verma Director General, NIC
24 <sup>th</sup> August 2021	COVID-19 Data and Analysis	Dr. Joy Merwin Monteiro, IISER Pune
21 <sup>st</sup> Sept 2021	Big Data & The Square Kilometer Array (SKA) Telescope	Prof. Yogesh Wadadekar, National Centre for Radio Astrophysics - Tata Institute of Fundamental Research, Pune
15 <sup>th</sup> Nov 2021	Machine Learning & Artificial Intelligence for Geoscience Applications	Dr. Deepak Subramani, Indian Institute of Science (IISc), Bangalore

### SustEN Talk Series (Sustainability and Environment)

PKCs Sust-En series consists of public talks, focused group discussions and workshops with experts in the environment and sustainability space. Through this series, PKC aims to promote collaborations, co-creation of technologies, and conceptualization of city-scale projects to solve key issues related to carbon emissions, waste-water treatment, improving air quality, and green energy production.

Date	Topic	Speaker
22 <sup>nd</sup> March 2022	Importance Of Green Spaces For Well Being Of Citizens	Dr. Jayant Kulkarni, Indian Forest Service (IFS)
22 <sup>nd</sup> June 2022	How India can expand forest and tree cover to meet its Sustainable Development (SDGs) and Climate Goals	Dr. Rajiv Kumar Chaturvedi, Assistant Professor at BITS Pilani, K. K. Birla, Goa Campus.



## Health Talk Series (Health)

PKC's Health talk series aims to promote active discussions on mapping, tracking, mitigation, and understanding the impact of diseases at a city level. The series hosts talks, stakeholder meetings, and workshops to highlight health issues that plague the city and potential measures for their mitigation. It will also showcase research, and clinical and technological advances in the healthcare ecosystem.

Date	Topic	Speaker
7 <sup>th</sup> -8 <sup>th</sup> July 2022	Targeted therapies in Oncology	Dr. Anuradha Choughule, Professor & Faculty Scientist, Consultant Molecular Laboratory
17 <sup>th</sup> May 2022	Prevention and Control of Hypertension	Dr. Harshal Pandve, Professor & Head, Dept. of Community Medicine (PSM), PCMC's PGI-YCMH, Pimpri, Pune
28 <sup>th</sup> June 2022	Importance of Epidemiology from a Public Health Perspective	Dr. Prakash Doke, Professor, Department of Community Medicine
27 <sup>th</sup> July 2022	Evidence-based Decisions in Healthcare: The Role of Statistics	Dr. Chitra Lele, President & Founder, Actu-Real, Inc.

## Sustainable Mobility

PKCs Sustainable Mobility talk series aims to foster active discussions on the use of effective and sustainable transportation systems for cities.

Date	Topic	Speaker
26 <sup>th</sup> Feb 2022	PKC National Science Day special talk: Electric and Sustainable Mobility	Mr. Manoj Kumar Daniel, Deputy General Manager, Maha-Metro Rail Corporation Limited Pune  Dr. Rahul Walawalkar, Founder & President, India Energy Storage Alliance (IESA), President & MD, Customized Energy Solutions India Ltd.  Dr. Sushil Ramdasi, Deputy Director, Powertrain Engineering Laboratory, Automotive Research Association of India (ARAI)

## STEM Popularization Talks

### a) Popularization of Citizen Science

Date	Topic	Speaker
22 <sup>nd</sup> July 2021	Finding features in Galaxies: Introductory Lecture 1	Prof. Ajit Kembhavi, Principal Investigator, PKC
24 <sup>th</sup> July 2021	Finding features in Galaxies: Introductory Lecture 2	Prof. Ajit Kembhavi, Principal Investigator, PKC
27 <sup>th</sup> July 2021 31 <sup>th</sup> July 2021 04 <sup>th</sup> Aug 2021 8 <sup>th</sup> Aug 2021	Finding features in Galaxies: Training Session 1 Training Session 2 Training Session 3 Training Session 4	Prof. Sudhanshu Barway, Assistant Professor, Indian Institute of Astrophysics, Bangalore
28 <sup>th</sup> Feb 2022	One Million Galaxies! Launch event	1. Prof. Kembhavi (Principal Investigator, PKC)  2. Prof. Barway (Assistant Professor, Indian Institute of Astrophysics, Bangalore)  3. Dr. Ashish Mahabal (Lead Computational and Data Scientist, California Institute of Technology)  4. Prof. Changbom Park (Professor, Korea Institute for Advanced Study)  5. Dr. Disha Sawant (Assistant Program Manager, PKC)
13 <sup>th</sup> July 2022	The Search for Alien Life in our Galaxy	Dr. Ravi Kopparapu , scientist at NASA Goddard Space Flight Center

## b) Conversations with Women Role Models in STEM

An initiative which aims to bring forward the journey of women in various fields of Science, Technology, Engineering & Mathematics (STEM). This series is conducted in an informal conversational format to help the audience relate to the lives of successful women professionals in S&T, knowing first-hand about their success stories, their failures, and how they moved ahead to make a mark in their field. We hope this initiative will inspire young women to break gender stereotypes, societal barriers and encourage them to pursue careers in STEM.

Date	Topic	Speaker
30 <sup>th</sup> June 2022	My Journey in Chemistry	Dr. Shobha Waghmode, Professor & Head Department Of Chemistry, MES Abasaheb Garware College, Pune.
30 <sup>th</sup> July 2022	My Pursuit of a Research Career in Drug Discovery	Prof. Sadhana Sathaye, Professor of Pharmacy, Institute of Chemical Technology (ICT), Mumbai.

## Interdisciplinary Training Programs & Courses

PKC in collaboration with diverse stakeholders conducts courses and training programs with an aim to empower students, young researchers and working professionals with employability skills pertaining to Industry, academia, entrepreneurship.



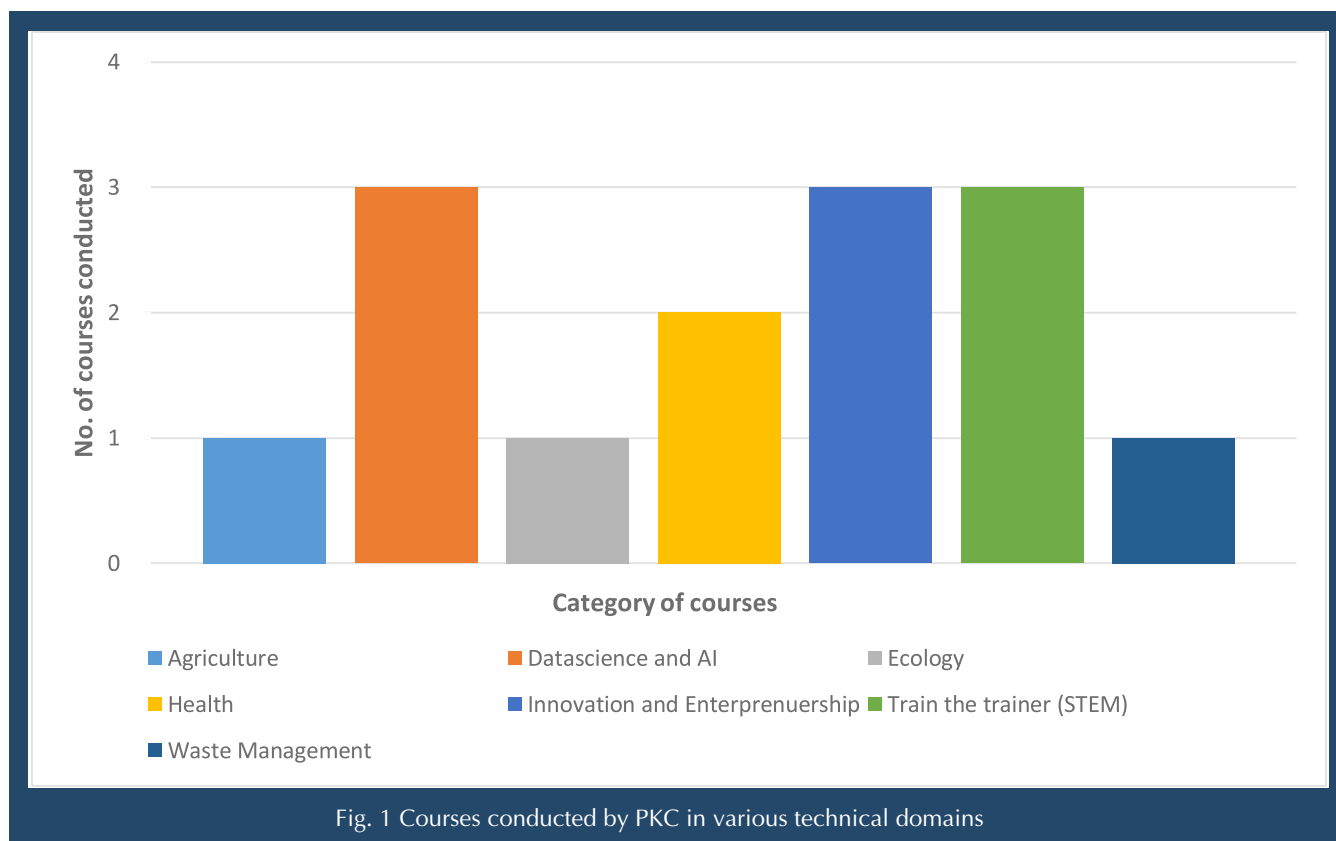
**Course Contents**

1. Introduction to Key Pillars of Responsible AI
2. Interpretable and Explainable AI –I
3. Interpretable and Explainable AI –II
4. Fairness AI
5. Privacy Preserving AI -I
6. Privacy Preserving AI -II
7. Privacy Preserving AI –III
8. Secure AI
9. Reproducible AI
10. Accessible AI

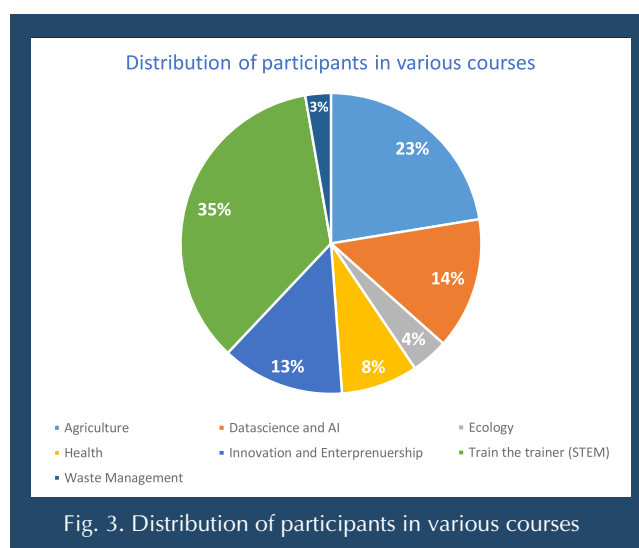
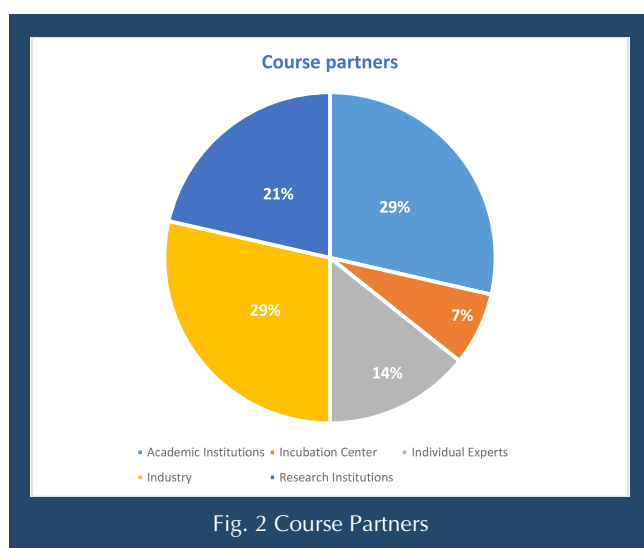
Responsible Artificial intelligence (5 April - 22 March 2021), in partnership with Persistent Systems Ltd.

## Impact

14 training courses across different technical domains of science, technology, and innovation have been conducted so far (Fig. 1) by experts from different partner organizations including R & D organizations, academic institutions, and incubation centers (Fig. 2).



A total of 727 individuals benefited from the various courses conducted by PKC (Fig. 3). 53% of the participants were females (Fig. 4), 23% were students, 40% were teachers and 37 % were working professionals (Fig. 5).



Gender distribution of participants

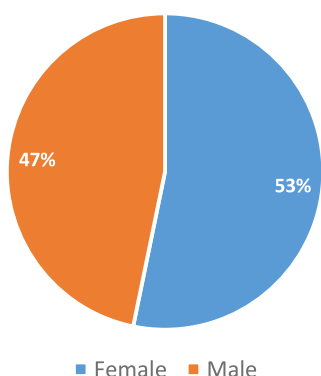


Fig. 4: Gender distributions of participants

Distribution based on professional qualification

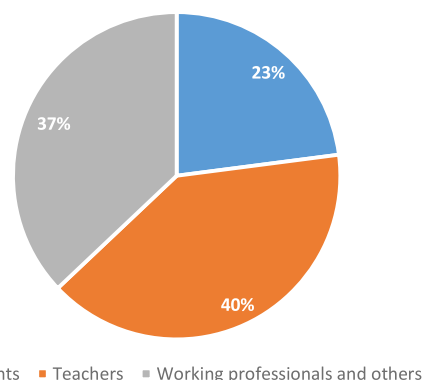


Fig. 5: Distribution of participants based on their professional qualification

## Details of courses conducted by PKC during Jan 2021- May 2022

Title	Partner Organisation	Date	Total Sessions	Total Beneficiaries
A virtual Course on Vaccine production, Basics, Pitfalls, and Troubleshooting (An industry perspective on vaccine production)	Serum Institute of India, PVT.LTD, Pune	15 <sup>th</sup> Jan '20 - 5 <sup>th</sup> Feb '21	10	28
Microbial Processes for Energy Recovery from Organic Wastes (Theoretical knowledge and industrial know-how on working of microbial biofuel cells )	Agharkar Research Institute, Pune	15 <sup>th</sup> Feb - 26 <sup>th</sup> Feb '21	12	20
Skills for Innovators (Soft skills and management principles for effective innovation and entrepreneurship)	Venture Center, Pune	16 <sup>th</sup> Feb - 25 <sup>th</sup> Feb '21	4	13
Natural language processing (NLP) acceleration Program (latest trends and techniques in NLP )	Icertis, Pune	8 <sup>th</sup> April - 25 <sup>th</sup> May '21	9	48
A primer on biodiversity and ecology of Freshwater ecosystems of the western ghats (A food chain-based approach to learning biological components of the freshwater ecosystem in western ghats)	Agharkar Research Institute, Pune	15 <sup>th</sup> April - 30 <sup>th</sup> April '21	9	29

Title	Partner Organisation	Date	Total Sessions	Total Beneficiaries
Responsible Artificial Intelligence (Current status, challenges, and future opportunities )	Persistent Systems, Pune	5 <sup>th</sup> April - 31 <sup>st</sup> May '21	15	23
Plant Breeding Today: New Techniques, New Skills (Real-time development of new varieties by molecular methods)	Dr. Vidya Gupta (CSIR- NCL, Pune), Prof. Sujata Bhargava (Dept Of Botany, SPPU)	14 <sup>th</sup> June - 25 <sup>th</sup> June '21	10	163
Understanding and exploring Epidemiology (Concepts and methods in modern times)	School of Health Sciences, (SPPU)	20 <sup>th</sup> July - 27 <sup>th</sup> August '21	10	32
Entrepreneurial skills development course for young researchers in biotechnology (Idea generation, opportunity evaluation, company formation, funding opportunities for biotech start-ups)	Agharkar Research Institute, Pune	11 <sup>th</sup> Oct - 29 <sup>th</sup> Oct '21	20	63
Starting the Innovation Journey (Basics and best practices in innovation)	Dr. Aditya Gondhalekar, Capgemini, Pune	20 <sup>th</sup> - 27 <sup>th</sup> Nov - 4 <sup>th</sup> Dec '21	3	20
Concepts in science and Skill Development Program विज्ञान विषयातील संकल्पना आणि कौशल्य विकसन कार्यक्रम (Bilingual pedagogy training for teachers)	District Institute of Education and Training (DIET), Pune	18 <sup>th</sup> Oct '21 - 10 <sup>th</sup> Jan '22	12	194





14<sup>th</sup> June -25<sup>th</sup> June 2021

# PLANT BREEDING TODAY

## NEW TECHNIQUES, NEW SKILLS















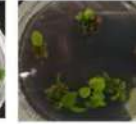






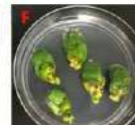






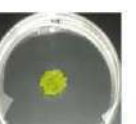

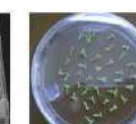
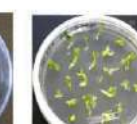








## Soybean Transformation Pipeline



Cotyledonary node								
Half-seed								
Somatic Embryo								
	Immature seeds	SE induction	Bombardment		SE desiccation	SE Germination		

**Sources:**  
 Clemente Lab, UNL  
 Zhang Lab, MU  
 Wang Lab, ISU  
 Parrot Lab, UGA; Finner Lab, OSU

Plant Breeding Today: New Techniques, New Skills (14 - 25 June 2021)

## STEM INITIATIVES



As per predictions by the National Science Foundation 80% of jobs in the next decade will require skills pertaining to Science Technology, Engineering, and Mathematics (STEM). Exam-focused learning models which emphasizes more on fact memorization or rote learning is leading to a lack of creativity, innovativeness, and problem-solving skills in Indian students. Therefore there is a need for including inquiry-based learning modules to be incorporated in school curriculum along with development of skill sets like digital literacy and sustainability amongst students.

Pune Knowledge Cluster is deeply engaged in programs that encourage teachers to adopt pedagogical techniques focused on inquiry-based teaching and learning with the use of digital tools. The programs are especially run in schools that are low on resources with an emphasis on engaging in hands - on activities for experiential learning.

PKC has two ongoing STEM initiatives:

- Improvement Programs for STEM Teaching & Learning in Classrooms
- Support Programs for Women in STEM





## Objectives

- In line with NEP 2020, foster critical thinking, analytical ability, logical reasoning and curiosity
- Encourage teachers to adopt pedagogical techniques focusing on inquiry-based, hands-on learning
- Follow a train the trainer approach for scaling initiatives
- Setting up or strengthening of Atal Tinkering Labs in schools
- Focus on the use of digital tools, introduce AI and ML in high schools
- Create a digital repository of STEM resources

## Improvement Programs for STEM Teaching-Learning Methodologies in Classrooms

### Ongoing Projects

#### Capacity building of school teachers in STEM

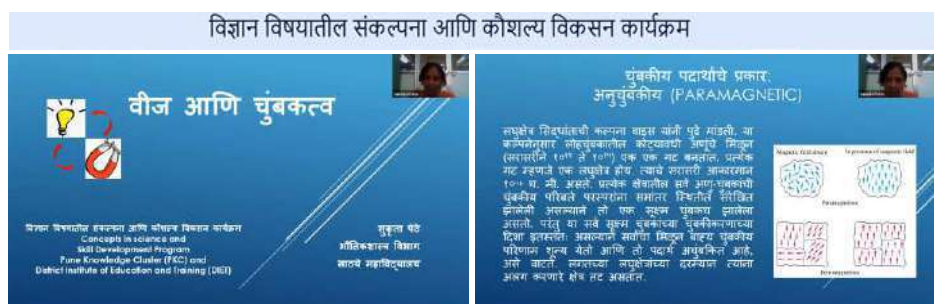
PKC has been actively involved in creating programs for teachers in government schools in and around Pune in collaboration with the local administrative authorities.



PKC team at the launch of 'Shala Sudhar Karyakram' organized by Pune Zilla Parishad and District Institute of Education and Training, Pune at The Divisional Commissioner's Office on 6th May 2020. Launched by Hon. Deputy Chief Minister Shri. Ajit Pawar, the Shala Sudhar Program aims to improve the quality of school infrastructure and teaching in and around Pune.

#### Concepts in science and Skill Development Program (विज्ञान विषयातील संकल्पना आणि कौशल्य विकसन कार्यक्रम)

PKC and District Institute of Education and Training (DIET), Pune surveyed 1500+ school teachers in the Pune district, to understand gaps in teaching methodologies for STEM. Pedagogical methods were designed based on the analysis of the data collected and over 450+ teachers from Pune Zilla Parishad schools were trained on using these methods for effective classroom and virtual teaching.





### Hands-on STEM Teacher Training

PKC in collaboration with the Center for Science Education and Communication (CSEC), Savitribai Phule Pune University (SPPU) organized a 2 Day Hands-on STEM Teacher Training Workshop on 20<sup>th</sup> and 21<sup>st</sup> April 2022. The workshop was attended by 42 school teachers teaching 6<sup>th</sup> to 9<sup>th</sup> grades.

The workshop focused on hands-on training and conceptual understanding of scientific topics which teachers face challenges in teaching using conventional methods. This workshop was funded by Lenovo India foundation under PKC's 'Teach with Tech' initiative.





## Improvement Programs for STEM Teaching-Learning Methodologies in Classrooms

### Ongoing Projects

#### Digital Literacy Skill Development Programs for Students

Teach with Tech PKC in collaboration with Lenovo India Foundation implements a program called 'Teach with Tech' a two-tier STEM program for school students from 6th to 9th grade and their teachers to complete parenthesis. This project aims to provide an opportunity to students and teachers to access and adopt digital content related to science, mathematics and technology. PKC works with five schools (Vidyapeeth School - Pune University campus, Modern High School, Ganeshkhind, Shivaji Vidya Mandir, Aundh, Gholap High school, Sanghvi, and Nutan Mahila Vidhyala Girls School, Sadashiv Peth in Pune.





## Planned Projects

### a) Gamification in STEM Learning

PKC is working with a group of education experts to develop programs which include gamification at the curriculum level in schools. It aims at designing and developing gaming software/tools and training programs that are mapped with school and undergraduate curriculum at elementary & secondary levels. The training programs will be designed to train teachers to develop and design game based tools in alignment to NEP 2020. The broad objective is to create a pool of trained teachers (train the trainer approach), who will in turn train more teachers which will benefit a larger group of students. In the course of time, a repository of game-based teaching-learning platforms will be developed through a participatory approach and deployed at scale.

### b. STEM labs

The Atal Tinkering Labs (ATLs), established across the country by Atal Innovation Mission (AIM), NITI Aayog, aim to foster curiosity, creativity, and imagination in young minds; inculcate skills such as design mindset, computational thinking, adaptive learning, computing, etc. PKC aims to integrate various themes aligned with its verticals such as air pollution, sustainable mobility, water management, solid waste management, public health and effective education with ATL-based activities and develop innovative projects to solve problems of the city. PKC aims to identify gaps in the use of already existing ATL STEM labs in the city to enable their strengthening. PKC also will enable ATLs to train teachers and students to utilise the ATL labs effectively. PKC aims to pilot this program in 5 ATLs STEM labs in Pune.

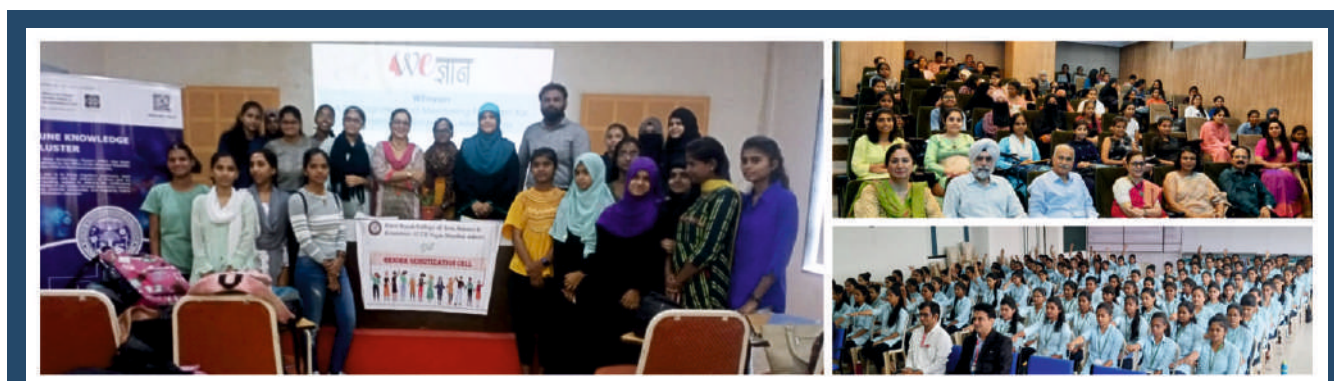
## Support Programs for Women in STEM

PKC is committed towards enhancing the participation of women in basic and applied sciences through mentoring, research and scholarship programs.

### Ongoing Project



An initiative by Pune Knowledge Cluster and BASF Chemicals India private limited, the program aims to offer funding support, mentorship and entrepreneurial skill development to deserving women candidates in Maharashtra. Scholarships and grants are offered to women from marginalized communities at the undergraduate and post graduate level for pursuing research or entrepreneurship in Chemistry and Allied Areas. Through this initiative, PKC aims to increase enrollment and retention of women in scientific streams creating a more gender-equal workforce.



Wenyan Awareness Sessions:- Left -Guru Nanak College of Arts, Science, and Commerce, Mumbai, 23rd June 2022, Top Right: Guru Nanak Institute of Research and Development (GNIRD) Mumbai, 22nd June 2022. Bottom Right: Yashwantrao Bhonsale College of Pharmacy, Sawantwadi, 24th May 2022. PKC conducted WEnyan Awareness Sessions in 22 colleges across various districts of Maharashtra. between April - June 2022. Sessions were attended by 1442 students.

## Partners

### Funding Partners



### Program Partners



जिल्हा शिक्षण व प्रशिक्षण संस्था, पुणे  
District Institute of Education and  
Training (DIET) Pune



## PARTNERS

FUNDING
BASF Chemicals India
Cummins Foundation
Hindustan Unilever
Lenovo India
Persistent Foundation
Rockefeller Foundation
Schlumberger
University of Southampton
ACADEMIC ORGANIZATIONS
Armed Forces Medical College, Pune
BJ Medical College, Pune
Indian Institute of Science Education and Research, Pune
Dr. Bhanuben Nanavati College of Architecture for Women
Maharashtra University of Health Sciences, Nashik
Savitribai Phule Pune University
Symbiosis International University, Lavale, Pune
Symbiosis Medical College for Women, Pune
Symbiosis Statistical Institute, Pune
RESEARCH ORGANIZATIONS
Agharkar Research Institute, Pune
Automotive Research Association of India, Pune
Centre for Development Of Advanced Computing, Pune
Centre for Materials for Electronic Technology
Christian Medical College, Vellore
CSIR-Centre for Cellular and Molecular Biology, Hyderabad
CSIR-National Chemical Laboratory, Pune
Deenanath Mangeshkar Hospital
Defence Institute of Advanced Technology, Pune
Flame Centre for Earth and Environment, Flame University, Pune
King Edward Memorial Hospital and Research Centre, Pune
National Centre for Biological Sciences, Bengaluru
Noble Hospital, Pune
Symbiosis University Hospital and Research Centre
Wildlife Research & Conservation Society, Pune

## PARTNERS

SOCIETIES & ASSOCIATIONS
CODATA National Committee
Indian Academy of Sciences
Indian National Science Academy
Institute of Electrical and Electronic Engineers, Pune
Society of Automotive Engineers, India
GOVERNMENT BODIES
District Institute of Education and Training, Pune Zilla Parishad
Pune Municipal Cooperation
Pune Smart City
INCUBATION/ INNOVATION CENTERS
C4i4 - Center for Industry 4.0, Pune
Venture Center, Pune
NGOS & CLUSTERS
Bhujal Abhiyaan, Mission Groundwater, Pune
Center for Environment Education, Pune
Samuchit EnviroTech, Pune
Water Valley, Denmark
INDUSTRY
Genepath Laboratories
Icertis
Illumina
Infosys Springboard
International Business Machines
Persistent Systems
PH Diagnostics
Praj Industries
Premas Biotech
Sahayadri Speciality Labs
Serum Institute of India
Suburban Diagnostics
Suyog Lifecare Diagnostics
TATA Consultancy Services
Thyrocare

## MoU's & MoA's

PKC has signed Memorandum of Understandings (MoU's)/ Memorandum of Associations (MoA's) with 30 organizations.

Ajeenkya D. Y. Patil University, Pune
Armed Force Medical College (AFMC), Pune
Automotive Research Association of India (ARAI) , Pune
BASF Chemicals India
B. J. Medical College, Pune
Centre for Materials for Electronics Technology (C-MET), Hyderabad
Centre for Development Studies and Activities, Pune
College of Engineering Pune (CoEP), Pune
CSIR - Centre For Cellular And Molecular Biology (CCMB), Hyderabad
CSIR - National Chemical Laboratory, Pune
Defence Institute of Advanced Technology (Deemed to be University), Pune
District Institute of Education and Training (DIET), Pune
Dr. D. Y. Patil Vidyapeeth, Pune
Entrepreneurship Development Center, Venture Center, Pune
FLAME Centre for Earth and Environment, FLAME University, Pune
GAIA - The Earth Foundation
Indian Institute for Science Education & Research (IISER), Pune
Infosys Springboard
King Edward Memorial Hospital and Research Centre (KEMHRC), Pune
Lenovo India
MACS - Agharkar Research Institute, Pune
Maharashtra University of Health Sciences, Nashik
MKSSS's Dr. Bhanuben Nanavati College of Architecture for Women, Pune
National Centre for biological Sciences - Tata Institute of Fundamental Research, Bengaluru
Savitribai Phule Pune University (SPPU), Pune
Symbiosis International (Deemed University) Symbiosis Statistical Institute, Pune
Symbiosis International (Deemed University), Pune for and behalf of its Constituents
'Symbiosis Medical College for Women (SMCW)', Pune and 'Symbiosis University Hospital and Research Centre', Pune
Symbiosis International University, Lavale, Pune



# PKC IN NEWS



पुणे

Published: February 16, 2022 04:21 PM

## Science | विज्ञान : दुनिया में खगोलविदों के लिए सार्वजनिक रूप से डेटा उपलब्ध कराएगा भारत



Deepak Pandey  
रिपोर्टर | नवभारत.कॉम





NEWS / CITY NEWS / PUNE NEWS / Citizens To Keep An Eye On Under Care Saplings Via Ai

THIS STORY IS FROM FEBRUARY 21, 2022

Citizens to keep an eye on under care saplings via AI

SWATI SHINDE COLE / Feb 21, 2022, 04:20 IST

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Home / Cities / Pune / Pune: How CSIR-NCL is playing key role in Omicron fightback

Premium

## Pune: How CSIR-NCL is playing key role in Omicron fightback

The Pune Knowledge Cluster is coordinating a genome surveillance project funded by Rockefeller Foundation as part of which samples are procured from all over Pune and beyond through the B J Government Medical College.

Home / Cities / Pune / Arabinda Mitra: 'Pune has potential to solve national and international issues'

## Arabinda Mitra: 'Pune has potential to solve national and international issues'

PKC, which has been set up to create a common platform facilitating healthy interaction between researchers, R&D and industries in Pune, was approved by the Union government in August.

खगोलशास्त्रज्ञ बनून काही तरी असेल. पण, अवघड समीकरणे गंची ही इच्छा अपूर्णच राहिली आहे. एका महाशोधचा भाग



Home / Cities / Pune News / Pune gets official sanction for Knowledge Cluster

## Pune gets official sanction for Knowledge Cluster

### Pune News

Pune Knowledge Cluster to launch citizen science astronomy programme on National Science Day

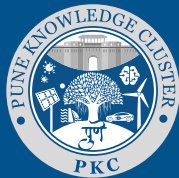
NEWS / CITY NEWS / PUNE NEWS / Pune Knowledge Cluster To Take Up Projects On Ecology

THIS STORY IS FROM AUGUST 13, 2020

Pune Knowledge Cluster to take up projects on ecology, health in region gets underway

TNN / Updated: Aug 13, 2020, 10:50 IST

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